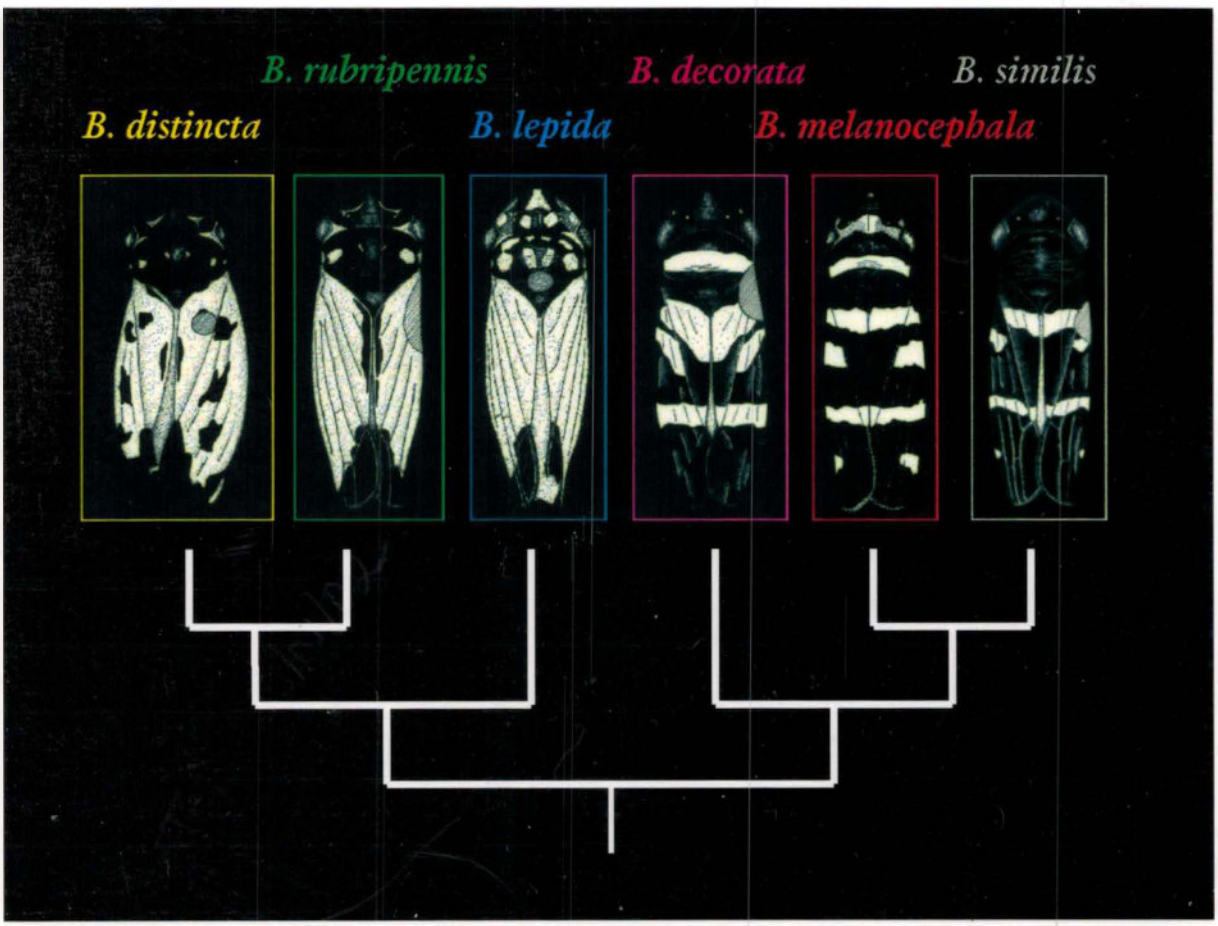
DANIELA MAEDA TAKIYA

Revisão taxonômica e análise filogenética das espécies do gênero neotropical *Balacha* Melichar (Insecta, Hemiptera, Cicadellidae, Cicadellinae)



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DANIELA MAEDA TAKIYA

REVISÃO TAXONÔMICA E ANÁLISE FILOGENÉTICA DAS ESPÉCIES DO GÊNERO NEOTROPICAL *Balacha* MELICHAR (INSECTA, HEMIPTERA, CICADELLIDAE, CICADELLINAE)

Banca examinadora:

Dr. Gabriel Luis F. Mejdalani

Dr. Rodney Cavichioli

Dr. Ricardo Campos da Paz

Rio de Janeiro, 23 de abril de 2001

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Orientador: Prof. Dr. Gabriel Luis Figueira Mejdalani (Departamento de Entomologia, Museu Nacional, UFRJ).

Co-orientador: Prof. Dr. Alcimar do Lago Carvalho (Departamento de Entomologia, Museu Nacional, UFRJ).

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II – Título

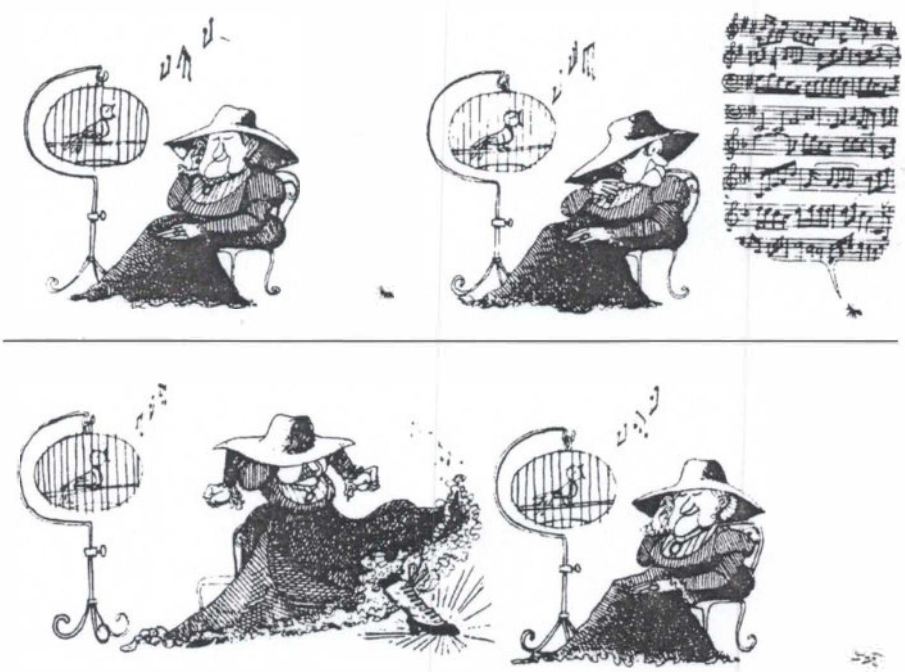
"Olhou pra rua. Começou a achar horrível aquele cheiro de jasmim, o céu assim tao cinzento. (..) Quis ir embora. Atravessou o túnel correndo. Pra poder sair logo lá fora.

E lá fora era a floresta. Terra. Cheiro de folha. Sol. Um ar assim de quem já choveu. O Vítor cheirou o ar: forte, bem forte; e cheirou de novo. Ficou parado. Se espantando de ter esquecido que lá fora era tão bom. E quando olhou pra unha viu que ela estava quieta, feito coisa que agora ia dormir muito tempo."

O sofá estampado / Lygia Bojunga Nunes

"But soft! What light through yonder window breaks?
It is the east and Juliet is the sun! -
Arise, fair sun, and kill the envious moon,
Who is already sick and pale with grief,
That thou, her maid, art far more fair than she.."

Romeo and Juliet / William Shakespeare



Ni arte ni parte / Quino

À minha mãe Christina e ao meu orientador Gabriel

por terem me ensinado como fazer ciência.

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RESUMO GERAL

Revisão taxonômica e análise filogenética das espécies do gênero Neotropical *Balacha* Melichar (Insecta, Hemiptera, Cicadellidae, Cicadellinae).

No presente trabalho são apresentadas uma redescrição do gênero *Balacha* Melichar e redescrições e ilustrações das espécies reconhecidas como pertencentes ao mesmo: *B. decorata* Cavichioli & Sakakibara, *B. distincta* (Signoret), *B. lepida* Cavichioli & Sakakibara, *B. melanocephala* (Signoret) (espécie-tipo), *B. rubripennis* Cavichioli & Sakakibara e *B. similis* Cavichioli & Sakakibara. Nas redescrições são adicionados novos caracteres morfológicos, principalmente da genitália feminina. O esternito abdominal interno VIII foi observado pela primeira vez em *B. distincta*, *B. rubripennis* e *Pawiloma ancora* Young. Um neótipo para *B. melanocephala* é designado, considerando que o espécime tipo está provavelmente perdido. A distribuição geográfica das espécies do gênero é revista, sendo fornecidos novos registros de *B. decorata* (Brasil: Minas Gerais), *B. distincta* (Brasil: São Paulo), *B. melanocephala* (Uruguai e Argentina) e *B. similis* (Brasil: Minas Gerais e Rio de Janeiro), além de considerados como errôneos os registros na Colômbia de *B. distincta* e *B. melanocephala*. Uma chave taxonômica para as espécies de *Balacha* baseada em espécimes machos e fêmeas é fornecida. Uma análise cladística incluindo as espécies de *Balacha* e onze táxons externos considerados como relacionados a esse gênero, baseadas em 64 caracteres morfológicos, corrobora a hipótese de monofiletismo de *Balacha* e seu relacionamento como grupo-irmão de *Pegogonia* Young. O monofiletismo de *Balacha* é sustentado pelas sinapomorfias não-ambíguas presentes no plano básico do gênero, como a coroa anteriormente pronunciada, com a margem anterior subangular, transição coroa-fronte, em vista dorsal, formando uma ângulo agudo, pronoto, em vista lateral, continuando o perfil dorsal da cabeça e mesonoto, corpo do edeago sem processos cuticulares e dentes da segunda válvula do ovipositor apresentando uma

projeção dorsal na metade anterior. O gênero *Balacha* é composto de duas linhagens principais bem sustentadas por sinapomorfias, o clado das *Balacha* vermelhas (*B. lepida* (*B. distincta* + *B. rubripennis*)) e o clado das *Balacha* pretas (*B. decorata* (*B. melanocephala* + *B. similis*)). Alguma evidência é dada para assumir uma mudança para um hospedeiro vegetal do gênero *Eryngium* (Apiaceae) no ancestral das espécies recentes de *Balacha*. Com base no posicionamento filogenético de uma espécie não descrita de Cicadellini, um novo gênero é proposto: *Caragonia bella* n. gen. n. sp. é descrito do sudeste do Brasil (Minas Gerais e São Paulo). *Caragonalia monstruosa* (Signoret) é transferida para o novo gênero proposto com base em uma combinação de plesiomorfias e hipóteses de sinapomorfias (as últimas do padrão de coloração e genitália feminina) compartilhadas com *Caragonia bella*, como a coroa pouco pronunciada, com margem anterior largamente arredondada, transição coroa-fronte formando aproximadamente um ângulo de 90 graus, pronoto elevado posteriormente, clavo das asas anteriores com a margem jugal marrom escura, esternito abdominal VII feminino alongado com uma dobra mediana longitudinal, bases da primeira válvula do ovipositor apresentando uma concavidade distinta e dentes da segunda válvula do ovipositor gradualmente em declive posteriormente.

GENERAL ABSTRACT

Taxonomic revision and phylogenetic analysis of species of the Neotropical genus *Balacha* Melichar (Insecta, Hemiptera, Cicadellidae, Cicadellinae).

In the present work a redescription of the genus *Balacha* Melichar and also redescriptions and illustrations of its six recognized species are provided: *B. decorata* Cavichioli & Sakakibara, *B. distincta* (Signoret), *B. lepida* Cavichioli & Sakakibara, *B. melanocephala* (Signoret) (type-species), *B. rubripennis* Cavichioli & Sakakibara, and *B. similis* Cavichioli & Sakakibara. In the redescriptions are included new morphological characters, specially those of the female genitalia. The internal abdominal sternite VII was observed for the first time in *B. distincta*, *B. rubripennis* and *Pawiloma ancora* Young. A neotype for *B. melanocephala* is elected, considering the type specimen is probably lost. The geographical distribution of the species of the genus is reviewed, including new records of *B. decorata* (Brazil: Minas Gerais State), *B. distincta* (Brazil: São Paulo State), *B. melanocephala* (Uruguay and Argentina) and *B. similis* (Brazil: Minas Gerais and Rio de Janeiro states). Previous records from Colombia of *B. distincta* and *B. melanocephala* are taken as erroneous. A key to species based on male and female specimens of *Balacha* is also provided. A cladistic analysis of the known species of *Balacha* and eleven related outgroup taxa, based on 64 morphological characters, corroborates the hypothesis of monophyly of the genus and its sister group relationship to *Pegogonia* Young. *Balacha* is defined by the unambiguous synapomorphic traits present in its groundplan, like the anteriorly produced crown with a subangulate anterior margin, crown-frons transition forming an approximately distinct acute angle, flattened pronotum continuing contour of head and mesonotum in lateral view, aedeagus shaft without cuticular sculpturing, and teeth of second valvulae of ovipositor presenting an anterior dorsal projection. The genus comprises two major lineages that are well supported by synapomorphies, the red *Balacha*

clade (*B. lepida* (*B. distincta* + *B. rubripennis*)), and the black *Balacha* clade (*B. decorata* (*B. melanocephala* + *B. similis*)). Some evidence is provided for assuming a host plant shift to *Eryngium* (Apiaceae) in the ancestral of recent *Balacha* species. Based on the phylogenetic position of one undescribed Cicadellini species, a new genus is proposed: *Caragonia bella* n. gen. n. sp. is described from Southeastern Brazil (Minas Gerais and São Paulo states). *Caragonalia monstruosa* (Signoret) is transferred to the new genus proposed based on a combination of plesiomorphic and putative female synapomorphic characters (the latter from the color pattern and female genitalia) shared with *Caragonia bella* n. sp., like the little produced crown with anterior margin broadly round, transition crown-face forming an approximately 90 degree angle, posteriorly elevated pronotum, forewing clavus with jugal margin bordered with dark brown, elongate female sternite VII with a median longitudinal elevated fold, bases of first valvulae of ovipositor presenting a distinct concavity, and teeth of second valvulae of ovipositor gradually declivous posteriorly.

SUMÁRIO

INTRODUÇÃO GERAL

O gênero neotropical *Balacha* Melichar é composto atualmente por seis espécies, todas ocorrendo no Brasil. YOUNG (1977), em sua revisão dos Cicadellini do Novo Mundo, reconheceu somente duas espécies válidas nesse gênero: *B. distincta* (Signoret), proveniente da Colômbia, e a espécie-tipo, *B. melanocephala* (Signoret), distribuída pelo norte da Argentina, Uruguai, Colômbia e sul do Brasil (Rio Grande do Sul). No caso de *B. melanocephala*, Colômbia é provavelmente um registro errôneo de METCALF (1965) que lista a localidade-tipo "Nova Granada" como sendo referente ao antigo nome da Colômbia e Panamá na época colonial até 1820 (ver PAPAVERO 1971: 38-39). Possivelmente, Nova Granada se refere a uma localidade do Estado de São Paulo, Brasil (UNITED STATES BOARD ON GEOGRAPHIC NAMES 1963). CAVICHIOLI & SAKAKIBARA (1988) registraram a ocorrência de *B. melanocephala* no Estado do Paraná e descreveram quatro novas espécies do sul do Brasil: *B. similis*, *B. decorata*, *B. rubripennis* e *B. lepida*.

Segundo YOUNG (1977), o gênero está incluído no grupo genérico *Erythrogonia* Melichar, sendo bastante relacionado a *Pegogonia* Young e podendo ainda ser relacionado a *Sibovia* China e *Pawiloma* Young. *Balacha* pode ser diferenciado desses gêneros e dos demais Cicadellini pela combinação da coroa pronunciada anteriormente, apresentando a margem anterior estreitamente arredondada ou subangular e o edeago apresentando uma curvatura drástica em sua base, característica compartilhada com *Pegogonia*, mas com o ápice direcionado posteriormente.

A presente dissertação aborda o gênero *Balacha* e alguns outros gêneros de Cicadellini relacionados ao primeiro. São apresentados dois manuscritos inéditos: (1) **Systematics of the genus *Balacha* Melichar (Hemiptera: Cicadellidae: Cicadellini)** e (2) ***Caragonia*, a new genus of Cicadellini (Hemiptera: Cicadellidae: Cicadellinae) from Southeastern Brazil**. No primeiro artigo, foram feitas redescrições do gênero

Balacha e das espécies incluídas no mesmo. Nessas redescrições foram incluídas novas características diagnósticas da morfologia, especialmente da genitália feminina. Uma chave para as espécies de *Balacha* com base em espécimes machos e fêmeas é apresentada. Uma hipótese de relacionamento entre as espécies de *Balacha* é proposta com base em caracteres morfológicos. Baseado no posicionamento filogenético resultante dessa análise, uma espécie não descrita de Cicadellini do sudeste do Brasil é incluída em um novo gênero, o qual é abordado no segundo artigo. *Caragonalia monstruosa* (Signoret), do sudeste do Brasil, é transferida para o novo gênero.

Systematics of the genus *Balacha* Melichar (Hemiptera: Cicadellidae: Cicadellini)

Daniela M. Takiya [1, 2, 3] & Gabriel Mejdalani [4]

[1] Laboratório de Entomologia, Departamento de Zoologia, Universidade Federal do Rio de Janeiro (UFRJ), Caixa Postal 68044, 21944-970 Rio de Janeiro, RJ, Brasil; [2] E-mail: takiya@acd.ufrj.br; [3] Pós-graduação em Zoologia, Museu Nacional, UFRJ; [4] Departamento de Entomologia, Museu Nacional, UFRJ, Quinta da Boa Vista, São Cristóvão, 20940-040 Rio de Janeiro, RJ, Brasil.

ABSTRACT

Redescriptions of the genus *Balacha* Melichar and also of its six recognized species are provided, adding new morphological characters, specially those of the female genitalia. The female internal abdominal sternite VIII is illustrated for the first time for *B. distincta*, *B. rubripennis* and *Pawiloma ancora* Young. A neotype for *B. melanocephala* is elected, considering the type specimen is probably lost. The geographical distribution of species of the genus is reviewed, including new records: *B. decorata* (Brazil: Minas Gerais State), *B. distincta* (Brazil: São Paulo State), *B. melanocephala* (Uruguay and Argentina) and *B. similis* (Brazil: Minas Gerais and Rio de Janeiro states). Previous records from Colombia of *B. distincta* and *B. melanocephala* are taken as erroneous. A key to species based on male and female specimens of *Balacha* is also provided. A cladistic analysis of the known species of the genus *Balacha* and eleven related outgroup taxa, based on 64 morphological characters, corroborates a hypothesis of monophyly of the genus and its sister group relationship to *Pegogonia* Young. *Balacha* is defined by synapomorphic traits in its ground plan, like the anteriorly produced crown with a subangulate anterior margin, crown-frons transition forming an approximately distinct acute angle, flattened pronotum continuing

contour of head and mesonotum in lateral view, aedeagus shaft without cuticular sculpturing, and teeth of second valvulae of ovipositor presenting an anterior dorsal projection. The genus comprises two major lineages that are well supported by synapomorphies, the red *Balacha* clade (*B. lepida* (*B. distincta* + *B. rubripennis*)), and the black *Balacha* clade (*B. decorata* (*B. melanocephala* + *B. similis*)). Some evidence is provided for assuming a host plant shift to *Eryngium* (Apiaceae) in the ancestral of recent *Balacha* species.

Keywords: *Balacha*, taxonomy, cladistic analysis, Neotropical, Cicadellidae, Cicadellinae, *Eryngium*.

INTRODUCTION

Victor Signoret, in his revision of the Tettigonides (fairly equivalent to the subfamily Cicadellinae **sensu** YOUNG 1968, 1977, 1986), described *Tettigonia distincta* Signoret from Colombia (SIGNORET 1854a: 27) and *T. melanocephala* Signoret from New Granada (SIGNORET 1854b: 341). In this work the author included all 396 species known at the time in the immense genus *Tettigonia* Geoffroy, invalidating some genera proposed by other authors due to the difficulty he found on establishing species groupings.

Leopold Melichar was the second author to attempt producing a taxonomical study including all Cicadellinae species. Five volumes of his work "Monographie der Cicadellinen" were published between 1924 and 1951. On the third volume, MELICHAR (1926) published a key to identification of the 101 recognized genera of Cicadellaria, which corresponds with few exceptions to the tribe Cicadellini recognized by YOUNG (1977, 1986). In this key, the genus *Balacha* was cited for the first time (MELICHAR 1926: 343). Until the fifth volume, Melichar provided descriptions of only 19 genera of the

Cicadellaria and, due to his death in 1924, *Balacha*, as well as several other genera, remained without formal description, designation of type-species or notes on the included species. According to YOUNG (1968), the parts of Melichar's manuscript where those genera were treated were not appropriate for **post-mortem** publication.

Posteriorly, William E. China studying the manuscripts and work published by MELICHAR (1926), assigned the type-species of all 55 genera included on the Cicadellaria key that remained without designation of a type-species (CHINA 1938). In this work, *Tettigonia melanocephala* was assigned as the type-species of the genus *Balacha*.

The first author to provide a formal description of the genus *Balacha* (YOUNG 1977: 725) was David A. Young in his thorough study of the Cicadellinae subfamily (YOUNG 1968, 1977, 1986). There he transferred *Tettigonia distincta* to this genus based on the study of the male lectotype from Colombia (YOUNG & BEIER 1964), the single representative specimen of that species found at the Natural History Museum in Vienna at the time. It is possible that Colombia is an erroneous species record due to some confusion on Signoret specimen labels, since all specimens of *Balacha* (including other *B. distincta*) studied herein are distributed on Southeastern South America. These mistakes concerning localities of old specimen labels are apparently common in the Cicadellidae as noted by SCHRÖDER (1959) for *Molomea biimpressa* (Signoret) and MEJDALANI **et al**. (2000) for *Amblyscartidia spinolai* Mejdalani, Felix & Takiya as well as in the Membracidae, as noted by SAKAKIBARA (1999) for *Micrutalis flavozonata* (Fairmaire) and *M. tripunctata* (Fairmaire). Additionally, YOUNG (1977) recorded *B. melanocephala* to be known from Northern Argentina, Uruguay, Southern Brazil (Rio Grande do Sul State) and Colombia. We believe that in the *B. melanocephala* case, Colombia is truly an erroneous record by METCALF (1965: 287), who listed the type-locality as Colombia, probably referring to New

Granada as the old Colombian and Panamanian name during colonial times until 1820 (PAPAVERO 1971: 38-39). It is possible that New Granada refers to a locality found at São Paulo State, Southeastern Brazil (UNITED STATES BOARD ON GEOGRAPHIC NAMES 1963). YOUNG (1977) was also the first author to propose a position to the genus *Balacha* in a systematical context based on a subjective morphological analysis, including it in his *Erythrogonia* Melichar generic group (YOUNG 1977: 770) and relating it to the genera *Pegogonia* Young, *Pawiloma* Young and *Sibovia* China.

The most important contribution to the taxonomy of *Balacha* was published by Rodney R. Cavichioli and Albino M. Sakakibara. They redescribed *B. melanocephala* based on specimens from Southern Brazil and described four new species from the same region, *B. similis* Cavichioli & Sakakibara, *B. decorata* Cavichioli & Sakakibara, *B. rubripennis* Cavichioli & Sakakibara and *B. lepida* Cavichioli & Sakakibara, (CAVICHIOLI & SAKAKIBARA 1988).

In the present paper, we redescribe the genus *Balacha*, adding unpublished morphological diagnostic characters, and review the taxonomic status of its included species. The species are redescribed, including new distinctive morphological characters, specially those of the female genitalia. A taxonomic key for all six recognized species based on male and female specimens is presented. It is also proposed herein a hypothesis of phylogenetic relationships between those species.

MATERIALS AND METHODS

The species of *Balacha* and the comparative material of other related cicadellines examined herein are listed in Appendix I, which also includes new geographical records and a neotype designation for *B. melanocephala*. Most morphological terminology follows YOUNG (1968, 1977), but terminology for the head structures follows HAMILTON (1981)

and that of the female genitalia follows NIELSON (1965), with exception of the third valvulae which are treated herein as gonoplacs, as suggested by MEJDALANI (1998). Techniques for preparation of genital structures follow those of OMAN (1949). The dissected parts are stored in microvials with glycerin.

Morphological characters were identified based on their topographical identity before proposing hypotheses of primary homology by defining the states in the data matrix (DE PINNA 1991, BROWER & SCHAWAROCH 1996). Characters were reductively coded (**sensu** WILKINSON 1995), particularly in cases of presence/absence data of a structure and some trait of the present structure, as defended by HAWKINS **et al.** (1997). When two states were found to be present in one terminal taxon for a specific character, both states were coded in the matrix and the character was treated as polymorphic for optimal tree searches (SWOFFORD & BEGLE 1993). Multistate characters were treated as unordered under the Fitch parsimony (FITCH 1971) due to an impossibility of ordering by the method of intermediates (WILKINSON 1992), with the single exception of character 36 (a continuous length relation between states). Parsimony-uninformative autapomorphic characters were included in the data matrix following the suggestion of YEATES (1992).

The ingroup taxa consisted of all six species of *Balacha*. The outgroup choice was based on the subjective *Erythrogonia* generic group assembled by YOUNG (1977), considering the lack of estimates of phylogenetic relationships between genera in the tribe Cicadellini. These generic groupings suggested by YOUNG (1977) have been used as a source of possible outgroup taxa in all other specific phylogenetic analysis of genera of the Cicadellini (*Draeculacephala* Ball: DIETRICH 1994, *Parathona* Melichar: CAVICHIOLI 1997, *Lissoscarta* Stål: FELIX 2000). The selected outgroups for the present analysis were species belonging to four of the 27 genera included in the *Erythrogonia* generic group, *Pawiloma*: *P. ancora* Young and *P. victima* (Germar), *Pegogonia*: *P. rufipes* (Fabricius),

Sibovia: *S. picchitula* Young and *S. sagata* (Signoret), *Caragonalia* Young: *C. carminata* (Signoret) and *C. tarsalis* (Signoret); one genus belonging to the *Dilobopterus* Signoret generic group (YOUNG 1977: 82) *Amblyscarta* Stål: *A. bicincta* (Germar), *A. invenusta* Young and *A. stillifera* (Stål); and one undescribed species (TAKIYA **et al.** in prep.[1], treated herein as Cicadellini n. gen. n. sp.) externally similar to *Caragonalia monstruosa* (Signoret). Unfortunately, male specimens of *Pegogonia rufipes* were not studied, hence the information concerning the male genitalia is based solely on YOUNG (1977).

Considering there is no data available on phylogenetic relationships between the outgroup taxa and the genus *Balacha*, the most parsimonious trees were calculated without an **a priori** hypothesis of character polarization with the determination of a root (NIXON & CARPENTER 1993, FERRARIEZZI & MARQUES 1997). Although it is advantageous to assume no character polarization hypothesis, this method in fact inflates the data matrix with the inclusion of characters that are invariable in the ingroup, but informative for the outgroup taxa (MADDISON **et al.** 1984, SWOFFORD & BEGLE 1993). The root was positioned **a posteriori** between the outgroup and the ingroup.

The data set was mostly analyzed using PAUP 3.1.1 for Apple Macintosh (SWOFFORD 1993), but jackknife estimates and successive weighting approximations were run in PAUP* 4.0b6 for Windows (SWOFFORD 1998), in the latter case to avoid the shortcoming of the earlier version due to the presence of multistate taxa (ROGNES 1999). Maximum parsimony analyses were performed using the branch and bound algorithm (HENDY & PENNY 1982, SWOFFORD **et al.** 1996) searching for all most parsimonious diagrams. The most parsimonious trees found were summarized into a strict consensus tree (SOKAL & ROHLF 1981). Successive weighting procedures were based on maximum value

[1] Takiya, D. M., Cavichioli, R. R. & Mejdalani, G. (in prep.) *Caragonia*, a new genus of Cicadellini (Hemiptera: Cicadellidae: Cicadellinae) from Southeatern Brazil.

of rescaled consistency index (FARRIS 1989, CARPENTER 1994). Mapping of character states on the consensus tree when more than one optimal assignment existed was done by the ACCTRAN and DELTRAN (SWOFFORD & MADDISON 1987) criteria.

Relative branch support was measured by repeating the analysis on 1,000 branch and bound jackknife replicates of the original data (FARRIS **et al.** 1996) and by calculating the support index (BREMER 1988, 1994) assisted by the software TreeRot v.2 (SORENSON 1999).

TAXONOMY

Genus *Balacha* Melichar

(Figs. 2-70, 72, 74)

Citation list before 1965 found in METCALF 1965: 286.
YOUNG 1977: 725.
CAVICHIOLI & SAKAKIBARA 1988: 279.
OMAN **et al.** 1990: 193, 297.

Type-species: *Tettigonia melanocephala* Signoret, by subsequent designation of CHINA (1938: 184).

Length: males, 6.1-8.0mm; females, 6.5-9.5mm.

Crown (Figs. 2, 14, 26, 32, 44, 45, 57, 69) moderately to strongly produced anteriorly; surface smooth, glabrous; median length varying from 6/10 to 9/10 interocular width and from 4/10 to 6/10 transocular width; anterior margin varying from narrowly rounded to subangulate in dorsal view, without carina at transition from crown to face. Ocelli (Figs. 2, 14, 26, 32, 44, 45, 57, 69) located on or behind imaginary transversal line between anterior angles of compound eyes; each ocellus equidistant from median line and adjacent anterior eye angle. Epicranial suture distinct or indistinct. Frontogenal sutures distinct, extending onto crown to near ocelli. Temporal sutures partially distinct or

indistinct. Antennal ledges (Figs. 2, 14, 26, 32, 44, 45, 57, 69) not protuberant in dorsal view; not carinate dorsally in lateral view; dorsal margin rectilinear and slightly oblique, descending anteriorly in lateral view. Frons (Fig. 70) flattened; disc finely granular; muscle impressions slightly distinct. Epistomal suture complete or incomplete. Clypeus (Fig. 70) not strongly produced, contour of its inferior portion in lateral view forming an angle with remainder area.

Pronotum (Figs. 2, 14, 26, 32, 44, 45, 57, 69) with width less than transocular width of crown; disc smooth or with rugae or fine striae on posterior portion, glabrous; lateral margins parallel; dorsopleural carinae (Fig. 70) complete or incomplete; posterior margin varying from strongly concave to straight. Mesonotum (Figs. 2, 14, 26, 32, 44, 45, 57, 69) smooth, may be finely transversely striated behind transverse sulcus. Forewings (Figs. 2, 14, 26, 32, 44, 45, 57, 69) with or without distinct membrane; venation almost indistinct; without an anteapical plexus of veins; presenting five apical cells, base of third more apical than all other apical cells bases; texture coriaceous and smooth. Hindlegs with femoral apex setal formula 2:1:0 or 2:1:1; first tarsomere longer than combined length of two more distal tarsomeres; plantar surface with two parallel rows of small setae, the external row may present peg-like setae in its proximal portion (Fig. 74).

Apex of ovipositor may or may not exceed the apex of forewings in resting position.

Male genitalia. Pygofer (Figs. 3, 15, 27, 33, 46, 58) moderately produced posteriorly; posterior margin varying from narrowly to broadly rounded; macrosetae distributed variably throughout disc. Valve (Figs. 7, 19, 31, 37, 50, 62) transverse; much wider than longer; may present parallel anterior and posterior margins, or a concavity on posterior margin, or a median constriction on both margins. Subgenital plates (Figs. 7, 19, 31, 37, 50, 62) slender, triangular; fused basally, sometimes linked by membranous area, giving the appearance of not being fused; rounded apically; extending or not posteriorly as far as

apex of pygofer; macro- and microsetae distributed variably throughout ventral surface. Connective (Figs. 5, 17, 29, 35, 48, 60) triangular or linear, in form of transverse bar; with or without median keel. Styles (Figs. 5, 17, 29, 35, 48, 60) extending posteriorly much farther than apex of connective; without conspicuous preapical lobe; with or without microsetae distributed on their preapical portion; apex rounded or truncate. Aedeagus (Figs. 4, 16, 28, 34, 47, 59) symmetrical; shaft cylindrical, slender, elongate; curved on its base by almost 180 degrees, may present longitudinal rows of small cuticular dentiform processes dorsally; with pair of apical processes. Paraphyses (Figs. 5, 17, 29, 48) present or absent.

Female genitalia. Abdominal sternite VII (Figs. 10, 22, 39, 53, 64) in ventral view variable interspecifically; anterior margin straight or produced anteriorly, may present median longitudinal fold; posterior margin with median area broadly rounded, with shallow or deep concavity, pair of concavities next to median area. First valvifers (Figs. 8, 20, 40, 51, 65) in lateral view with posterior margin slightly broadly concave mesally or with distinct concavity near posterior end. First valvulae of ovipositor (Figs. 10, 22, 39, 53, 64) in ventral view with bases varying from straight to concave mesally. Internal abdominal sternite VIII (Figs. 9, 21, 38, 52, 63) absent or present; when present forming in dorsal view a single sclerotized plate with posterior margin broadly concave. Pygofer (Figs. 8, 20, 40, 51, 65) in lateral view varying from very short to well produced posteriorly; posterior margin varying from narrowly rounded to tapering to an acute apex; few macrosetae distributed mainly along posteroventral margin. Gonoplacs valvifers (Figs. 8, 20, 40, 51, 65) with apex varying from broadly rounded to acute. Second valvulae (Figs. 13, 25, 43, 56, 68) in lateral view broadened beyond about 1/3 of total length excluding basal curvature, varying from regularly broadened to slightly tapering to apex; shaft bearing continuous teeth throughout broadened portion; teeth (Figs. 12, 24, 41, 55, 66)

elongate, anterior half presenting a dorsal projection, posterior half regularly high, denticles present throughout length of teeth; preapical area of shaft (Figs. 11, 23, 42, 54, 67) with dorsal and ventral margins bearing denticles, with prominence slightly distinct; apex narrowly rounded. (Female unknown in *B. lepida*).

Coloration. Species of *Balacha* present the ground color of head and thorax black, sometimes with pale, orange or red maculae on crown and red, orange or white maculae or stripes on pronotum. The forewings may have the ground coloration red, sometimes with black maculae, or black. sometimes with white maculae or stripes.

Distribution. *Balacha* specimens were studied from Uruguay, Argentina, Southeastern (Rio de Janeiro, Minas Gerais and São Paulo states) and Southern (Paraná and Rio Grande do Sul states) Brazil and possibly Colombia (Fig. 1).

Key to the species of *Balacha* Melichar

1 Pronotum completely black, or presenting bluish-white maculae or transversal stripe (Figs. 2, 32, 44, 57, 69); forewings completely black or generally presenting bluish-white or greenish-white maculae and/or stripes (Figs. 2, 32, 44, 57, 69); paraphyses present or absent (Figs. 5, 35, 60); female pygofer in lateral view longer than VII sternite (Figs. 8, 40, 65); female internal sternite VIII absent (Figs. 9, 38, 63); bases of first valvulae without anterior concavity in ventral view (Figs. 10, 39, 64). ..... black *Balacha* clade **2**

1' Pronotum completely black, or presenting round red maculae (Figs. 14, 26, 45); forewings completely red or presenting black markings (Figs. 14, 26, 45); paraphyses always present (Figs. 17, 29, 48); female pygofer in lateral view shorter than VII sternite (Figs. 20, 51); female internal sternite VIII present, sclerotized (Figs. 21, 52); bases of first valvulae with an anterior concavity in ventral view (Figs. 22, 53) (female unknown in *B. lepida*). ..... red *Balacha* clade **4**

2 (1) Forewings with triangular greenish-white marking on claval region extending to corium, oblique stripe on basal half of corium extending from costal margin to claval

suture, and transcommisural transversal stripe across bases of anteapical cells, bluish-white (Fig. 2); pronotum with bluish-white transversal stripe (Fig. 2); paraphyses present, linear (Fig. 5); female pygofer and gonoplac apices acute (Fig. 8). (Brazil: MG, PR).

..... ***B. decorata*** **Cavichioli & Sakakibara**

2' Forewings generally presenting three or four bluish-white transversal stripes, basalmost one and that over claval apex transcommissural (Figs. 32, 44, 57, 69); pronotum with or without bluish-white maculae or transversal stripe (Figs. 32, 44, 57, 69); paraphyses absent (Figs. 35, 60); female pygofer and gonoplac apices round (Figs. 40, 65).

..... **3**

3 (2') Pronotum generally with bluish-white transversal stripe (Figs. 32, 44); male pygofer with macrosetae distributed mainly along dorsal and posterior margins (Fig. 33); subgenital plates with short macrosetae (shorter than half of subgenital plate basal width) (Fig. 37); female sternite VII with median broadly rounded projection on posterior margin (Fig. 39); male length varying between 7.6-8.0 mm and female 9.2-9.5 mm. (Argentina; Uruguay; Brazil: PR, RS).

..... ***B. melanocephala*** **(Signoret)**

3' Pronotum generally without bluish-white maculae or transversal stripe (Figs. 57, 69); male pygofer with macrosetae distributed uniformly throughout surface of disc (Fig. 58); subgenital plates with long macrosetae (longer than half of subgenital plate basal width) (Fig. 62); female sternite VII with slight median broad concavity on posterior margin (Fig. 64); male length varying between 6.0-7.6 mm and female 7.1-8.5 mm. (Brazil: MG, PR, RJ, RS).

..... ***B. similis*** **Cavichioli & Sakakibara**

4 (1') Crown with large orange areas (Fig. 26); pronotum with two rows of round maculae, anterior ones orange and posterior ones red (Fig. 26); forewings red without black maculae (Fig. 26); paraphyses bifurcated, with divergent arms directed laterally in a 90 degrees angle with stem (Fig. 29); aedeagus without dorsal sculpturing (Fig. 28). (Brazil: PR).

..... ***B. lepida*** **Cavichioli & Sakakibara**

4' Crown completely black or with small pale or red areas (Figs. 14, 45); pronotum completely black or presenting round red maculae (Figs. 14, 45); forewings completely red or presenting black markings (Figs. 14, 45); paraphyses present (Figs. 17, 48); aedeagus with rows of dorsal small dentiform cuticle processes (Figs. 16, 47). **5**

5 (4') Pronotum with two pairs of round lateral red maculae (sometimes may be fused); forewings without black markings (Fig. 45); paraphyses bifurcated, with long arms directed anteriorly (Fig. 48); aedeagus with short rows of dorsal small dentiform cuticle processes along small area of apical third (Fig. 47); female sternite VII with narrow deep median concavity on posterior margin and a short (about 1/2 of sternite VII length) median longitudinal fold originating from anterior margin (Fig. 53); median length of female sternite VIII less than 1/4 of sclerotized area width (Fig. 52). (Brazil: PR).

..... ***B. rubripennis*** **Cavichioli & Sakakibara**

5' Pronotum completely black or presenting row of two or six red maculae (Fig. 14); forewings completely red or presenting black markings (Fig. 14); paraphyses bifurcated, with very short little divergent arms (Fig. 17); aedeagus with long rows of dorsal small dentiform cuticle processes along apical fourth (Fig. 16); female sternite VII with shallow median concavity on posterior margin and long (almost attaining posterior margin) median longitudinal fold originating from anterior margin (Fig. 22); median length of female sternite VIII about 1/4 of sclerotized area width (Fig. 21). (Colombia [?], Brazil: SP).

..... ***B. distincta*** **(Signoret)**

Balacha decorata Cavichioli & Sakakibara

(Figs. 2-13)

CAVICHIOLI & SAKAKIBARA 1988: 285.

Length: males, 7.1-7.3mm; females, 8.2mm.

Crown strongly produced anteriorly (Fig. 2); median length approximately 8/10 interocular width and varying from 4/10 to 5/10 transocular width; anterior margin subangulate in dorsal view. Ocelli (Fig. 2) located behind imaginary transversal line

between anterior angles of compound eyes. Epicranial suture indistinct. Temporal suture indistinct. Epistomal suture complete.

Pronotum (Fig. 2) with disc smooth, slightly rugose on posterior 2/3; dorsopleural carinae incomplete; posterior margin with slight median concavity. Mesonotum (Fig. 2) smooth, finely striated transversally behind transverse sulcus. Forewings (Fig. 2) without distinct membrane. Hindlegs with femoral apex setal formula 2:1:1 (some specimens presenting 2:1:0 in one hindleg); plantar surface of first tarsomere with two parallel rows of small undifferentiated setae.

Coloration. Crown (Fig. 2) completely black (holotype), or median region presenting tan macula. Antennal ledges (Fig. 2) completely black or presenting their bases tan (holotype). Frons black. Clypeus black. Genae black; tan areas on superior portion. Lora black.

Pronotum (Fig. 2) black; bluish-white transversal stripe on posterior portion. Mesonotum (Fig. 2) black. Forewings (Fig. 2) black; basal triangular transcommissural maculae over large part of clavus, extending to costal region, sometimes almost attaining costal margin, greenish-white over clavus and bluish-white over corium; oblique stripe originating from claval suture, directed anteriorly and attaining costal margin, and transversal transcommissural stripe near clavus apex, attaining costal margin, bluish-white. Thoracic pleurites and legs black.

Abdominal sternites black, sometimes with posterior margins red.

Male genitalia. Pygofer (Fig. 3) with posterior margin subacute; macrosetae distributed throughout posterior 2/3. Valve (Fig. 7) with anterior and posterior margins presenting slight median concavity. Subgenital plates (Fig. 7) linked basally by membranous area; not extending posteriorly as far as apex of pygofer; each with one row of few macrosetae on median region; some microsetae distributed along external margin,

specially on basal portion; inner margin presenting on basal portion short and rounded process projected dorsally. Connective (Fig. 5) T-shaped; with median keel. Styles (Fig. 5) short; with microsetae on their preapical portion; apex rounded. Aedeagus (Fig. 4) without dorsal sculpturing; apex directed posteriorly; pair of short spiniform processes (Fig. 6) originating from dorsal margin of apex, approximately shorter than 1/10 aedeagal shaft length. Paraphyses (Fig. 5) present, short; with basal process directed anterodorsally; apex membranous, dilated and bilobed.

Female genitalia. Abdominal sternite VII (Fig. 10) in ventral view not very produced posteriorly; anterior margin straight, without longitudinal fold; median area of posterior margin broadly round. First valvifers (Fig. 8) in lateral view with distinct concavity near posterior end. First valvulae of ovipositor (Fig. 10) in ventral view with bases straight. Internal abdominal sternite VIII absent (Fig. 9). Pygofer (Fig. 8) in lateral view well produced posteriorly; posterior margin tapering to acute apex; macrosetae distributed along posterodorsal and posteroventral margins. Gonoplacs (Fig. 8) with apex acute. Second valvulae (Fig. 13) in lateral view slightly tapering to apex after basal broadening; bearing approximately 15 teeth along dorsal margin.

Other morphological characteristics as in the generic description.

Taxonomic notes. *Balacha decorata* shares with *B. melanocephala* + *B. similis* several synapomorphies of the black *Balacha* clade: (1) black forewing corium region between base of discal cells and claval apex with pair of white stripes (Figs. 2, 32, 44, 57), (2) uniseriate macrosetae on subgenital plates (Figs. 7, 37, 62), (3) first valvifers with a distinct concavity on posterior half of posterodorsal margin (Figs. 8, 40, 65), and (4) loss of the internal sclerotized abdominal sternite VIII (Figs. 9, 38, 63). It can be easily distinguished from the other *Balacha* species by the following unique features: (1) black clavus with triangular greenish-white marking that extends to corium (Fig. 2), (2) apex of

male and female pygofer and gonoplacs with an acute posterior margin (Figs. 3, 8), (3) elongate aedeagus shaft (Fig. 4), and (4) paraphyses with bilobed apex (Fig. 5).

Balacha distincta (Signoret)

(Figs. 14-25, 74)

Citation list before 1965 found in METCALF 1965: 287.
YOUNG 1977: 728.
YOUNG & BEIER 1964: 568.

Length: males, 6.9-7.3 mm; female, 8.3 mm.

Crown (Fig. 14) moderately produced anteriorly; median length approximately 6/10 interocular width and 4/10 transocular width; anterior margin subangulate in dorsal view; with small foveae located externally to each ocellus. Ocelli (Fig. 14) located slightly behind imaginary transversal line between anterior angles of compound eyes. Epicranial suture distinct, forming median longitudinal fovea on posterior portion of crown and transversal fovea located anteriorly to ocelli. Temporal suture distinct. Epistomal suture complete, or incomplete for short median distance.

Pronotum (Fig. 14) with disc smooth, presenting few fine straight transversal striae on posterior 2/3; dorsopleural carinae complete; posterior margin straight. Mesonotum (Fig. 14) smooth, finely transversely striate behind transverse sulcus. Forewings (Fig. 14) with distinct membrane, including all four inner apical cells and the apices of the inner anteapical cell, of the outermost apical cell, of the brachial cell, and sometimes of the clavus. Hindlegs with femoral apex setal formula 2:1:1 (one specimen presenting 2:1:1:1 in one hindleg); plantar surface of first tarsomere with two or three peg-like setae (first, second and sometimes fourth) on proximal portion of the external row of setae (Fig. 74).

Coloration. Crown (Fig. 14) black; pair of triangular maculae in front of ocelli and pair of lateral maculae on posterior margin adjacent to compound eyes, pale-yellow. Antennal ledges (Fig. 14) black; apices reddish or brownish. Frons black, presenting pair of lateral elongate red (lectotype) or pale maculae. Clypeus black; pair of rounded lateral reddish (lectotype) or brownish maculae. Genae black; pale yellow maculae on superior portion. Lora brownish or red (lectotype).

Pronotum (Fig. 14) completely black, or with two or six (lectotype) rounded red maculae forming transverse row, the outermost maculae extending to the lateral lobes, over the dorsopleural carinae. Mesonotum (Fig. 14) black. Forewings (Fig. 14) red; membrane brown; inner margin of clavus bordered of dark brown; clavus presenting (lectotype) or not one dark brown macula on basal third; corium presenting (lectotype) or not three dark brown maculae disposed in a longitudinal row, the proximal macula located near the base of the inner discal cell, the median one near the apex of the inner discal cell, and the apical one over the median portion of the median anteapical cell. Thoracic pleurites black. Legs with black coxae; femora, tibiae and tarsomeres brown or red (lectotype).

Male genitalia. Pygofer (Fig. 15) with posterior margin broadly rounded; base of ventral margin with distinct concavity; macrosetae distributed throughout anteroventral and posterior portions. Valve (Fig. 19) with median conspicuous constriction. Subgenital plates (Fig. 19) fused basally; extending or not (lectotype) posteriorly as far as apex of pygofer; each plate with numerous short macrosetae distributed irregularly throughout its whole extension, few microsetae distributed along external margin of basal portion. Connective (Fig. 17) linear, transversal; anterior margin concave with a short median projection. Styles (Fig. 17) very elongate; presenting microsetae on preapical portion; the apical 1/5 bent, turned laterally; apex rounded. Aedeagus (Fig. 16) with dorsal irregular rows of small cuticular dentiform processes along apical 1/4, almost attaining apex; apex

of shaft directed posterodorsally; pair of foliaceous processes (Fig. 18) arising from lateral margins of aedeagus apex, approximately 1/3 of shaft length. Paraphyses (Fig. 17) present, bifurcated apically; arms little divergent, much shorter than stalk; stalk with basal half very membranous.

Female genitalia. Abdominal sternite VII (Fig. 22) in ventral view very produced posteriorly; anterior margin with median area projected anteriorly; median longitudinal fold broadened apically, extending posteriorly to almost attaining anterior margin; posterior margin with median area presenting shallow concavity. First valvifers (Fig. 20) in lateral view with posterior margin slightly concave mesally. First valvulae of ovipositor (Fig. 22) in ventral view with base presenting median concavity. Internal abdominal sternite VIII (Fig. 21) in dorsal view forming single transversal sclerotized plate, posterior margin with pair of scoop-shaped lateral folds underneath the main plate; median length about 1/4 of total width. Pygofer (Fig. 20) in lateral view very short; posterior margin rounded; macrosetae distributed along posteroventral margin. Gonoplacs (Fig. 20) with apex broadly rounded. Second valvulae (Fig. 25) in lateral view regularly broadened; bearing approximately 24 teeth along dorsal margin.

Other morphological characteristics as in the generic description.

Taxonomic notes. *Balacha distincta* is closely related to *B. rubripennis* sharing with the latter some synapomorphic traits as: (1) crown with pair of pale markings in front of ocelli (Figs. 14, 45), (2) clavus with jugal margin bordered with dark brown (Figs. 14, 45), (3) loss of processes on inner margin of subgenital plates, (4) elongate styles (Figs. 17, 48), and (5) elongate aedeagus shaft with rows of small cuticular dentiform processes (Figs. 16, 47). It can be easily distinguished from other *Balacha* species by the unique pair of foliaceous apical processes of aedeagus presenting small cuticular dentiform processes (Fig. 18).

Balacha lepida Cavichioli & Sakakibara

(Figs. 26-31, 72)

CAVICHIOLI & SAKAKIBARA 1988: 290.

Length: male, 6.4 mm.

Crown (Fig. 26) moderately produced anteriorly; median length approximately 6/10 interocular width and 4/10 transocular width; anterior margin rounded in dorsal view. Ocelli (Fig. 26) located on imaginary transversal line between anterior angles of compound eyes. Epicranial suture indistinct. Temporal suture, in part, distinct. Epistomal suture complete.

Pronotum (Fig. 26) with smooth disc, presenting few fine straight transversal striae on posterior 2/3; dorsopleural carinae complete; posterior margin straight. Mesonotum (Fig. 26) smooth, transversally striated behind transverse sulcus. Forewings (Fig. 26) with distinct membrane including the inner four apical cells, apexes of outer apical, inner and median anteapicals and brachial cells, and apex of clavus. Hindlegs with femoral apex setal formula 2:1:1; plantar surface of first tarsomere with four peg-like setae (first, second, third, and fourth) on proximal portion of the external row.

Coloration. Crown (Fig. 26) orange; longitudinal median stripe originating from posterior margin, attaining imaginary line between anterior margins of antennal ledges, and pair of lateral stripes originating from posterior margin, externally of ocelli and attaining anterior margin of crown, black; these stripes may be sometimes interrupted on anterior region of crown, where only two black maculae on anterior margin represent the apices of the stripes; they may be some other times expanded and fused covering most of crown with black (holotype); when crown is mostly black, pair of pale yellow markings on posterior margin of crown adjacent to compound eyes (holotype). Antennal ledges (Fig. 26) orange. Frons (Fig. 72) orange; pair of black longitudinal stripes continuous with crown stripes.

Clypeus (Fig. 72) black with pair of lateral orange maculae. Genae (Fig. 72) tan; pale yellow markings on superior and inferior portions. Lora (Fig. 72) orange.

Pronotum (Fig. 26) black; presenting 10 distinct maculae (holotype); four orange maculae on anterior portion, inner pair may be fused and outer ones may be fused with posterior median ones; six orange (holotype) or red maculae on posterior portion, larger than anterior ones, outer ones extending to lateral lobe of pronotum over dorsopleural carinae. Mesonotum (Fig. 26) black. Forewings (Fig. 26) completely red, sometimes may present paler venation well differentiated from remainder of wing (holotype); membrane dark brown. Thoracic pleurites black. Legs black; apices of femur and base of tibiae tan.

Male genitalia. Pygofer (Fig. 27) with posterior margin rounded; base of ventral margin with a distinct concavity; macrosetae distributed throughout posterior portion. Valve (Fig. 31) with posterior margin presenting median concavity. Subgenital plates (Fig. 31) linked basally by membranous area; extending posteriorly slightly beyond apex of pygofer; each with row of short macrosetae, extending from near base posteriorly not attaining apex; few microsetae distributed along outer margin on basal portion; inner margin presenting on basal portion short round process dorsally projected. Connective (Fig. 29) triangular; Y-shaped with short stalk; with median keel. Styles (Fig. 29) slender; with microsetae on their preapical portion; apex rounded. Aedeagus (Fig. 28) without dorsal sculpturing; apex directed posterodorsally; pair of flattened slender processes (Fig. 30) originating from laterodorsal margin of apex, approximately 1/3 of shaft length. Paraphyses (Fig. 29) present, bifurcated apically; arms divergent, directed laterally in a 90 degree angle with stalk, approximately 1/4 of stalk length.

Female unknown.

Other morphological characteristics as in the generic description.

Taxonomic notes. *Balacha lepida* shares with *B. distincta* + *B. rubripennis* several synapomorphies of the red *Balacha* clade: (1) crown with pair of pale markings on posterior margin adjacent to compound eyes (Figs. 14, 26, 45), (2) frons and clypeus with lateral markings (Fig. 72), (3) black pronotum without the incomplete or complete transversal white stripe on posterior portion, but presenting a transversal row of six red round maculae (Figs. 14, 26, 45), (4) outermost row of setae on plantar surface of basal tarsomere with basal two setae modified into peg-like ones (Fig. 74), (5) elongate subgenital plates attaining pygofer apex (Figs. 15, 27, 46), and (6) aedeagus apical processes articulated by membranous area to shaft (Figs. 18, 30, 49). It can be easily distinguished from all *Balacha* species by the orange markings on crown, face, and pronotum (Figs. 26, 72).

Balacha melanocephala (Signoret)

(Figs. 32-44)

Citation list before 1965 found in METCALF 1965: 287.
YOUNG 1977: 728.
ZANOL & MENEZES 1982: 20.
CAVICHIOLI & SAKAKIBARA 1988: 279.
OMAN **et al.** 1990: 193.

Length: males, 7.6-8.0 mm; females, 9.2-9.5 mm.

Crown (Figs. 32, 44) strongly produced anteriorly; median length varying from 8/10 to 9/10 interocular width and from 5/10 to 6/10 transocular width; anterior margin subangulate in dorsal view. Ocelli (Figs. 32, 44) located behind imaginary transversal line between anterior angles of compound eyes. Epicranial suture indistinct. Temporal suture indistinct. Epistomal suture incomplete.

Pronotum (Figs. 32, 44) with disc smooth, slightly rugose on posterior 2/3; dorsopleural carinae incomplete; posterior margin strongly concave. Mesonotum (Figs. 32,

44) smooth, finely striated transversally behind transverse sulcus. Forewings (Figs. 32, 44) without distinct membrane. Hindlegs with femoral apex setal formula 2:1:0 (one specimen presenting 2:0:0); plantar surface of first tarsomere with two parallel rows of undifferentiated setae.

Coloration. Crown (Figs. 32, 44) black; median longitudinal elongate pale tan macula extending from posterior margin anteriorly to imaginary line between anterior margins of antennal ledges; presenting or not (neotype) pair of lateral tan markings on posterior margin adjacent to compound eyes; sometimes all markings may be expanded and fused covering posterior region with tan; apex of crown presenting or not (neotype) tan oval macula extending to frons. Antennal ledges (Figs. 32, 44) tan (neotype) or pale yellow; apices black. Frons black. Clypeus black; pair of lateral light brown maculae. Genae tan; pale markings on superior and inferior regions. Lora black.

Pronotum (Figs. 32, 44) generally presenting transversal ivory stripe on posterior half (neotype); completely black in some specimens. Mesonotum (Figs. 32, 44) black. Forewings (Figs. 32, 44) black; four transversal bluish-white stripes, the basalmost one transcommisural, not attaining costal margin, the second originating from costal margin, attaining claval suture, the third also transcommisural over apex of clavus, and apicalmost one originating from costal margin, attaining middle of median anteapical cell, or shorter. Thoracic pleurites black. Legs black.

Abdominal sternites black, sometimes may present posterior margins light brown.

Male genitalia. Pygofer (Fig. 33) with posterior margin broadly rounded; ventral margin with conspicuous concavity on posterior region; macrosetae distributed throughout posterior portion. Valve (Fig. 37) with anterior and posterior margins presenting median concavity; the anterior concavity very wide. Subgenital plates (Fig. 37) linked basally by membranous area; not extending posteriorly as far as apex of pygofer; each with row of

short macrosetae extending from near base posteriorly to apical fourth; long microsetae distributed mainly along outer margin; inner margin presenting on basal portion short round process dorsally projected. Connective (Fig. 35) triangular; with median keel. Styles (Fig. 35) short; with microsetae on preapical portion; apex truncate. Aedeagus (Fig. 34) without dorsal sculpturing; apex directed posteroventrally; pair of cylindrical processes (Fig. 36) originating from ventral margin of apex, approximately 1/4 of shaft length. Paraphyses absent.

Female genitalia. Abdominal sternite VII (Fig. 39) in ventral view not very produced posteriorly; anterior margin straight, without median longitudinal fold; posterior margin with median area broadly rounded. First valvifers (Fig. 40) in lateral view with distinct concavity near posterior end. First valvulae of ovipositor (Fig. 39) in ventral view with bases straight. Internal abdominal sternite VIII (Fig. 38) absent. Pygofer (Fig. 40) in lateral view well produced posteriorly; posterior margin narrowly rounded; very few macrosetae along ventral and posterior margins. Gonoplacs (Fig. 40) with apex broadly rounded. Second valvulae (Fig. 43) in lateral view slightly tapering to apex after basal broadening; bearing approximately 19 teeth along dorsal margin.

Other morphological characteristics as in the generic description.

Taxonomic notes. *Balacha melanocephala* is closely related to *B. similis* sharing with the latter several synapomorphic traits: (1) black forewing corium region near apices of anteapical cells with small white macula on costal margin (Figs. 32, 44, 57), (2) styles with apex truncate (Figs. 35, 60), (3) loss of paraphyses, and (4) aedeagus presenting non-articulated apical processes arising from ventral margin of shaft (Figs. 36, 61). It can be easily distinguished from *B. similis* by the plesiomorphic small macrosetae along subgenital plates (Fig. 37) and by the female sternite VII with median portion of posterior margin convex and not produced posteriorly (Fig. 39).

Balacha rubripennis Cavichioli & Sakakibara

(Figs. 45-56)

CAVICHIOLI & SAKAKIBARA 1988: 288.

Length: male, 7.4 mm; female, 7.7 mm.

Crown (Fig. 45) moderately produced anteriorly; median length approximately 6/10 interocular width and 4/10 transocular width; anterior margin rounded in dorsal view. Ocelli (Fig. 45) located behind imaginary transversal line between anterior angles of compound eyes. Epicranial suture distinct or indistinct. Temporal suture partially distinct. Epistomal suture complete.

Pronotum (Fig. 45) with disc smooth, presenting fine transversal straight striae on posterior 2/3; posterior margin straight. Mesonotum (Fig. 45) smooth, striated transversally behind transverse sulcus. Forewings (Fig. 45) with distinct membrane, including all four inner apical cells and the apices of the inner anteapical cell and brachial cell. Hindlegs with femoral apex setal formula 2:1:1; plantar surface of first tarsomere with three to five peg-like setae on proximal portion of the external row of setae (holotype first, second and fifth setae), the first two more proximal ones always modified.

Coloration. Crown (Fig. 45) black; pair of lateral markings on posterior margin adjacent to compound eyes and pair of fine markings in front of ocelli that may extend slightly more anteriorly than apex of antennal ledges (holotype) or meet medially forming a V-shaped stripe directed to crown apex, pale yellow or orange with red areas (holotype). Antennal ledges (Fig. 45) completely black (holotype) or with small red maculae on median region or almost completely reddish-orange. Frons black; pair of lateral elongate pale yellow (holotype) or red maculae. Clypeus black; pair of lateral round red maculae.

Genae completely light brown, or with pale yellow marking on superior region (holotype). Lora orange or red (holotype).

Pronotum (Fig. 45) completely black or with four or six (holotype) maculae arranged in a transversal row, presenting (holotype) or not small pale orange oval inner two maculae; outer round red four maculae may be sometimes fused, outer ones extending to lateral lobe of pronotum over dorsopleural carinae. Mesonotum (Fig. 45) black. Thoracic pleurites brown. Legs light brown. Forewings (Fig. 45) red; membrane dark brown; inner margin of clavus bordered along short distance with dark brown.

Abdominal sternites brown, sometimes some sternites may present red posterior margins.

Male genitalia. Pygofer (Fig. 46) with posterior margin narrowly rounded; base of ventral margin with distinct concavity; macrosetae distributed along ventral and posterior margins. Valve (Fig. 50) with conspicuous median constriction. Subgenital plates (Fig. 50) linked basally by membranous area; extending posteriorly slightly beyond apex of pygofer; each with one row of short macrosetae extending from near base to apex and another inner row on posterior half; few microsetae distributed along outer margin on basal portion. Connective (Fig. 48) linear, transversal; without median keel. Styles (Fig. 48) slender and elongate; presenting microsetae along preapical region; apex round. Aedeagus (Fig. 47) with two short dorsal rows of small cuticular dentiform processes along small portion of apical third, not attaining preapical portion; apex directed posterodorsally; pair of cylindrical processes (Fig. 49) tapering to their apices, originating from lateral margins of shaft apex, approximately 1/4 of shaft length. Paraphyses (Fig. 48) present, very elongate, bifurcated apically; arms directed anteriorly, approximately 1/2 of stalk length.

Female genitalia. Abdominal sternite VII (Fig. 53) in ventral view well produced posteriorly; anterior margin straight, median longitudinal fold not broadened apically,

measuring about 1/2 of sternite length; posterior margin with deep concavity on median area. First valvifers (Fig. 51) in lateral view with posterior margin slightly concave mesally. First valvulae of ovipositor (Fig. 53) in ventral view with bases presenting median concavity. Internal abdominal sternite VIII (Fig. 52) in dorsal view forming single transversal sclerotized plate; median length less than 1/4 of total width. Pygofer (Fig. 51) in lateral view very short; posterior margin narrowly rounded; few macrosetae along posteroventral margin. Gonoplacs (Fig. 51) with apex broadly rounded. Second valvulae (Fig. 56) in lateral view regularly broadened; bearing approximately 23 teeth.

Other morphological characteristics as in the generic description.

Taxonomic notes. *Balacha rubripennis* is closely related to *B. distincta* (see notes on the latter species). It can be distinguished from all other *Balacha* species by the unique shape of paraphyses with rami apices directed anteriorly (Fig. 48).

Balacha similis Cavichioli & Sakakibara

(Figs. 57-70)

CAVICHIOLI & SAKAKIBARA 1988: 283.

Length: males, 6.1-7.6 mm; females, 7.1-8.5 mm.

Crown (Figs. 57, 69) moderately to strongly produced anteriorly; median length varying from 7/10 to 8/10 interocular width and 4/10 to 5/10 transocular width; anterior margin rounded or subangular in dorsal view. Ocelli (Figs. 57, 69) located on imaginary transversal line between anterior angles of compound eyes. Epicranial suture indistinct. Temporal suture indistinct. Epistomal suture complete.

Pronotum (Figs. 57, 69) with disc smooth, slightly rugose on posterior 2/3; dorsopleural carinae incomplete; posterior margin with slight median concavity. Mesonotum (Figs. 57, 69) completely smooth or with fine transversal striae behind

transversal sulcus (holotype). Forewings (Figs. 57, 69) without distinct membrane. Hindlegs with femoral apex setal formula 2:1:1; plantar surface of first tarsomere with two parallel rows of undifferentiated setae.

Coloration. Crown (Figs. 57, 69) completely black, or presenting median longitudinal pale tan macula extending from posterior margin anteriorly to imaginary line between anterior margins of antennal ledges (holotype). Antennal ledges (Figs. 57, 69) completely black (holotype), or with basal tan macula. Frons (Fig. 70) completely black (holotype), or with round tan macula on superior portion. Clypeus (Fig. 70) completely black, or presenting pair of lateral tan maculae (holotype). Genae (Fig. 70) black; pale yellow (holotype) or tan maculae on superior portion. Lora (Fig. 70) black.

Pronotum (Figs. 57, 69) completely black (holotype), or presenting ivory or bluish-white transversal stripe or maculae on posterior half. Mesonotum (Figs. 57, 69) black. Forewings (Figs. 57, 69) completely black, or presenting four transversal bluish-white stripes (holotype) as in *B. melanocephala* (basalmost two stripes may be yellowish-white), or only three stripes (apicalmost one absent), or even small bluish-white or yellowish-white maculae in variable number and disposition, but always placed on where the stripes would be. Thoracic pleurites black. Legs black.

Abdominal sternites black, some presenting posterior margins light brown or red (holotype).

Male genitalia. Pygofer (Fig. 58) with posterior margin narrowly rounded; macrosetae distributed throughout posterior 2/3. Valve (Fig. 62) with anterior margin presenting broad median concavity. Subgenital plates (Fig. 62) linked basally by membranous area; not extending posteriorly as far as pygofer apex; each with one row of long macrosetae (longer than half of subgenital plate basal width) extending from near base posteriorly almost to apex; few microsetae distributed along external margin,

specially on basal portion; inner margin presenting on basal portion short round process dorsally projected. Connective (Fig. 60) T-shaped, stalk short, with median keel. Styles (Fig. 60) short; with microsetae on preapical portion; apex truncate. Aedeagus (Fig. 59) without dorsal sculpturing; apex directed posteroventrally; pair of cylindrical processes (Fig. 61) originating from ventral margin of shaft apex; approximately 1/4 of shaft length. Paraphyses absent.

Female genitalia. Abdominal sternite VII (Fig. 64) in ventral view not very produced posteriorly, anterior margin straight, without median longitudinal fold; posterior margin with shallow concavity on median area. First valvifers (Fig. 65) in lateral view with distinct concavity near posterior end. First valvulae of ovipositor (Fig. 64) in ventral view with bases straight. Internal abdominal sternite VIII (Fig. 63) absent. Pygofer (Fig. 65) in lateral view well produced posteriorly; posterior margin narrowly rounded; few macrosetae dispersed on posterior half. Gonoplacs (Fig. 65) with apex broadly rounded. Second valvulae (Fig. 68) in lateral view regularly broadened; bearing approximately 29 teeth on dorsal margin.

Other morphological characteristics as in the generic description.

Taxonomic notes. *Balacha similis* is closely related to *B. melanocephala* (see notes on the latter species). It can be easily distinguished from all other *Balacha* species by the combination of unique long macrosetae along subgenital plates (Fig. 62) and shallow median concavity on posterior margin of female sternite VII (Fig. 64).

CLADISTIC ANALYSIS RESULTS

The data matrix (Table I) was composed of 17 terminal taxa (both ingroup and outgroup) and 64 morphological characters from the head, thorax, male and female genitalia (53 binary and 11 multistate). Eleven characters were considered parsimony

uninformative. The characters used in the present analysis are presented below and those characters assigned weight 0 or 1 (with the exception of autapomorphies) on successive weighting procedures are referred:

Morphological characters

Head and thorax

1. Head, thorax and forewings, coloration: (0) without longitudinal stripes (Figs. 2, 14, 26, 32, 44, 45, 57, 69); (1) with dark longitudinal stripes along greenish-yellow body (YOUNG 1977: Figs. 574a, 582a). The presence of dark longitudinal stripes is a synapomorphy shared by the species of *Sibovia* studied herein and is a putative synapomorphy of the genus, since most *Sibovia* species share this color pattern. Weight=1.

2. Head and thorax, ground coloration: (0) variable (YOUNG 1977: Figs. 600a, 146a); (1) black (Figs. 2, 14, 26, 32, 44, 45, 57, 69, 70, 71). Weight=1.

3. Crown-frons transition, lateral view: (0) forming an approximately right angle (Fig. 71); (1) forming a distinct acute angle (Fig. 70). State 1 is a synapomorphy of the genus *Balacha* and it is also independently shared by the species of *Sibovia* studied herein.

4. Crown, anterior margin, dorsal view: (0) broadly rounded (YOUNG 1977: Figs. 146a, 199a, 201a, 574a, 582a, 592a, 600a, 606a, TAKIYA **et al.** in prep.: Fig. 1); (1) narrowly rounded or subangulate (Figs. 2, 14, 26, 32, 44, 45, 57, 69). The narrowly round to subangulate anterior margin of crown is a synapomorphy of the genus *Balacha*. Weight=1.

5. Crown, dorsal view: (0) not produced anteriorly (YOUNG 1977: Figs. 146a, 199a, 201a, 592a, 606a, TAKIYA **et al.** in prep.: Fig. 1); (1) moderately to well produced anteriorly (Figs. 2, 14, 26, 32, 44, 45, 57, 69). The anteriorly produced crown is synapomorphic for *Balacha* species and independently shared by the species of *Sibovia* and *Pawiloma victima*.

6. Crown, discal region, coloration: (0) same as remainder of crown (Figs. 2, 14, 32, 44, 45, 57, 69); (1) with large orange regions that may expand and cover most of crown

surface (Fig. 26). The presence of orange regions on crown is an autapomorphy of *Balacha lepida*.

7. Crown, region in front of ocelli over temporal and frontogenal sutures, coloration: (0) same as remainder of crown (Figs. 2, 26, 32, 44, 57, 69); (1) presenting pale markings (Figs. 14, 45). The pair of pale markings in front of ocelli is a synapomorphy shared by *Balacha distincta* + *B. rubripennis*. Weight=1.

8. Crown, posterior margin adjacent to compound eyes, coloration: (0) same as remainder of crown (Figs. 2, 32, 44, 57, 69); (1) presenting pale maculae (Figs. 14, 26, 45). Due to the presence of both states in *Balacha lepida*, the presence of a pair of pale maculae adjacent to eyes can be a synapomorphy shared by the red *Balacha* or only by *B. distincta* + *B. rubripennis*.

9. Frons, lateral margins, coloration: (0) same as remainder of frons (Fig. 73); (1) presenting red or orange stripe (Fig. 72). Longitudinal stripes along frontogenal sutures is a synapomorphy of the red *Balacha*. Weight=1.

10. Frons, median region, coloration: (0) same as remainder of frons (Fig. 73); (1) presenting elongate orange macula (Fig. 72). The presence of the orange longitudinal macula on frons is an autapomorphy of *Balacha lepida*.

11. Clypeus, length, frontal view: (0) approximately as wide as long (Fig. 72); (1) elongate, longer than wide (Fig. 73). The elongate clypeus is a synapomorphy shared by *Sibovia* species. Weight=1.

12. Clypeus, lateral margins, coloration: (0) same as remainder of clypeus (Fig. 73); (1) presenting red or tan rounded maculae (Fig. 72). The presence of a pair of rounded maculae on lateral margins of clypeus is a synapomorphy of the red *Balacha*. Weight=1.

13. Clypeus, contour of inferior portion, lateral view: (0) continuing profile of face (Fig. 71); (1) forming an angle with profile of face (Fig. 70). State 0 is a synapomorphy shared by *Sibovia* species and is independently an autapomorphy of *Pegogonia rufipes*.

14. Pronotum, lateral margins, dorsal view: (0) convergent anteriorly (YOUNG 1977: Figs. 199a, 201a, 574a, 582a, 600a, 606a, TAKIYA **et al.** in prep.: Fig. 1); (1) parallel (Figs. 2, 14, 26, 32, 44, 45, 57, 69).

15. Pronotum, width: (0) greater than transocular width (YOUNG 1977: Figs. 199a, 201a, 574a, 582a, 600a, TAKIYA **et al.** in prep.: Fig. 1); (1) less than transocular width (Figs. 2, 14, 26, 32, 44, 45, 57, 69).

16. Pronotum, dorsal contour, lateral view: (0) elevated posteriorly (Fig. 71); (1) continuing profile of head and mesonotum (Fig. 70). The flattened pronotum in lateral view is a synapomorphy of *Balacha* species and is also independently shared by *Sibovia* species.

17. Pronotum, region adjacent to anterior margin, coloration: (0) same as remainder of pronotum (Figs. 2, 14, 32, 44, 45, 57, 69); (1) presenting four small orange maculae, median ones may sometimes be fused (Fig. 26). The row of small round maculae on anterior portion of pronotum is an autapomorphy of *Balacha lepida*.

18. Pronotum, median region, coloration: (0) same as remainder of pronotum (Figs. 2, 32, 44, 57, 69); (1) presenting pair of oval red maculae (Figs. 14, 26, 45). Due to an intraspecific polymorphism, depending on the character optimization, the presence of a pair of round maculae on median portion of pronotum can be a synapomorphy shared by all red *Balacha* with independent loss events within *B. distincta* and *B. rubripennis* (ACCTRAN) or it has arisen independently three times within *B. lepida*, *B. distincta* and *B. rubripennis* (DELTRAN). Weight=0.

19. Pronotum, posterior half, coloration: (0) same as remainder of pronotum (Figs. 2, 14, 26, 45, 57); (1) presenting transversal complete or incomplete bluish-white stripe (Figs, 32, 44, 70). Depending on the character optimization, the presence of the incomplete or complete transversal stripe on pronotum can be interpreted as a synapomorphy shared by *Balacha* and its sister genus *Pegogonia* followed by a loss of the markings in the red *Balacha* (ACCTRAN) or as two independent events, one in *Pegogonia rufipes* and another in the black *Balacha* (DELTRAN). *Balacha similis* presents both states.

20. Pronotum, lateral region, coloration: (0) same as remainder of pronotum (Figs. 2, 32, 44, 57, 69); (1) presenting pair of red rounded maculae that may sometimes be fused (Figs. 14, 26, 45). The presence of the four rounded maculae on lateral portions of pronotum is a synapomorphy shared by the red *Balacha*, with a posterior loss of it within *B. distincta*.

21. Forewings, ground coloration: (0) variable; (1) red (Figs. 14, 26, 45); (2) black (Figs. 2, 32, 44, 57, 69, 70, 71). The forewing coloration is ambiguous on the root of *Balacha*. Depending on the optimization, it can be red with independent events of transformation to black in *Pegogonia rufipes* and in the black *Balacha* (ACCTRAN), or black with posterior reversal to red in the red *Balacha*.

22. Forewings, clavus region posterior to mesoscutellum apex, coloration: (0) same as remainder of forewings (Figs. 14, 26, 45, 69, 70, 71); (1) presenting transcommissural transverse bluish- or greenish-white stripe that may extend to corium (Figs. 32, 44, 56); (2) presenting triangular greenish-white marking that extends to corium (Fig. 2). State 1 is a synapomorphy shared by *B. melanocephala* + *B. similis* and state 2 is an autapomorphy of *B. decorata*. Weight=0.

23. Forewings, clavus inner margins, coloration: (0) same as remainder of forewings (Figs. 2, 26, 32, 44, 57, 69); (1) bordered with dark brown (Figs. 14, 45). The dark brown

border of the jugal margin of clavus is a homoplastic synapomorphy shared by *B. distincta* + *B. rubripennis*.

24. Forewings, corium region between base of discal cells and apex of clavus, coloration: (0) same as remainder of forewings (Figs. 14, 26, 45, 69); (1) presenting pair of transverse bluish-white stripes, proximal one oblique, originating from costal margin and attaining claval sulcus, and apical one originating from claval apex, generally transcommissural, sometimes attaining costal margin (Figs. 2, 32, 44, 57). These stripes are a synapomorphic trait shared by all black *Balacha*, although it may be absent in some specimens of *B. similis*.

25. Forewings, corium region near costal margin and apices of anteapical cells, coloration: (0) same as remainder of forewings (Figs. 2, 14, 26, 45, 69); (1) presenting small bluish-white maculae (Figs. 32, 44, 57). The presence of this maculae on forewing has arisen in *Pegogonia rufipes* and, due to the presence of both states in *B. similis*, can be interpreted as a homoplastic synapomorphy shared by *B. similis* + *B. melanocephala* (ACCTRAN) or as independent events in each taxa (DELTRAN). Weight=0.

26. Hindlegs, two basalmost setae of external row on plantar surface of first tarsomere: (0) as remainder of setae in row; (1) forming peg-like setae (Fig. 74). The modified setae on plantar surface are a synapomorphic trait shared by *B. distincta* + *B. rubripennis*. Weight=1.

Male genitalia

27. Male pygofer, posterior margin, lateral view: (0) round (Figs. 15, 27, 33, 46, 58); (1) acute (Fig. 3); (2) concave dorsally (YOUNG 1977: Fig. 146c, MEJDALANI & NESSIMIAN 1991: Fig. 2); (3) tapering into small dentiform mesally directed process. The dorsal concavity is a possible synapomorphy of *Amblyscarta* species, the acute posterior margin

is an autapomorphy of *B. decorata* and the tapering posterior margin is an autapomorphy of *Caragonalia carminata*. Weight=1.

28. Valve, general aspect, ventral view: (0) linear and transverse (Figs. 7, 19, 31, 37, 50, 62, 76); (1) semi circular (Fig. 75). The semi circular valve is a possible synapomorphy of *Amblyscarta* species. Weight=1.

29. Subgenital plates, length, lateral view: (0) not attaining posteriorly pygofer apex (Figs. 3, 33, 58); (1) attaining posteriorly pygofer apex (Fig 15, 27, 46). Elongate subgenital plates that attain posteriorly the pygofer apex are a synapomorphy of the red *Balacha* clade, independently shared by the species of *Caragonalia*, and by *Amblyscarta invemusta* + *A. bicincta*. *B. distincta* presents both states.

30. Subgenital plates, bases, ventral view: (0) fused along very short distance (Figs. 7, 19, 31, 37, 50, 62, 75); (1) fused along 1/3 of total length (Fig. 76). The subgenital plates fused along a large basal distance is a synapomorphy shared by both species of *Pawiloma* studied herein. Weight=1.

31. Subgenital plates, length of macrosetae, ventral view: (0) shorter than half of plate basal width (Figs. 7, 19, 31, 37, 50, 75, 76); (1) approximately equal to or longer than half of plate basal width (Fig. 62). The long macrosetae on subgenital plates are an autapomorphy of *B. similis*.

32. Subgenital plates, number of longitudinal rows of macrosetae, ventral view: (0) two or more (Figs. 19, 31, 62); (1) one (Figs. 7, 37, 50, 75, 76). The presence of a single row of macrosetae along subgenital plates is a homoplastic synapomorphy shared by the black *Balacha*.

33. Subgenital plates, inner margin of base, dorsal view: (0) without processes (Figs. 15, 46); (1) presenting dorsal short rounded process (Fig. 33). In ACCTRAN optimization, the short round process on subgenital plate is a synapomorphy of *Balacha* species (although it

was not seen in *Pegogonia rufipes*) with a posterior loss of it in the *B. distincta* + *B. rubripennis* clade. In DELTRAN, the state 1 originates independently on the black *Balacha* and in *B. lepida*.

34. Subgenital plates, apex aspect, ventral view: (0) robust, broadly round (Figs. 7, 19, 31, 37, 50, 62); (1) slender, narrowly round (Figs. 75, 76).

35. Connective, general aspect, dorsal view: (0) transverse bar (Figs. 17, 48); (1) Y-shaped (Figs. 5, 29, 35, 60). The transverse bar connective is a synapomorphy shared by *B. distincta* + *B. rubripennis* and it is possibly an independent synapomorphy shared by *Amblyscarta* species.

36. Styles, length, dorsal view: (0) not exceeding apex of connective (YOUNG 1977: Fig. 574e); (1) portion posterior to apex of connective shorter than or equal to anterior portion (Figs. 5, 29, 35, 60); (2) portion posterior to apex of connective longer than anterior portion (Figs. 17, 48). Short styles (state 1) are a synapomorphy of *Sibovia* species and long ones (state 2) originated independently three times, as autapomorphies of *Pawiloma ancora* and Cicadellini n. gen. n. sp., and as a synapomorphy of *B. distincta* + *B. rubripennis*.

37. Styles, apex aspect, dorsal view: (0) round (Figs. 5, 17, 29, 48); (1) truncate (Figs. 35, 60); (2) inflate (YOUNG 1977: Fig. 606e); (3) acute (TAKIYA **et al.** in prep: Fig. 4). In ACCTRAN optimization, styles with round apices are a synapomorphy of *Balacha* with a posterior change to truncate apices in *B. melanocephala* + *B. similis*. Inflated apices is an autapomorphy of *Pawiloma ancora* and acute apices, of Cicadellini n. gen. n. sp. In addition to those autapomorphies, DELTRAN optimization favors the round apices as independent autapomorphies of *Pawiloma victima* and *B. decorata*, as well as a synapomorphy of the red *Balacha*.

38. Paraphyses, dorsal view: (0) absent (Figs. 35, 60); (1) present (Figs. 5, 17, 29). The loss of paraphyses is a homoplastic synapomorphy shared by *B. melanocephala* + *B. similis*.

39. Paraphyses, apex aspect, dorsal view: (0) bifurcated (Figs. 17, 29, 48); (1) bilobed (Fig. 5). The bilobed apex of paraphyses is an autapomorphy of *B. decorata*.

40. Paraphyses, stalk length, dorsal view: (0) longer than rami (Figs. 17, 29, 48); (1) shorter than rami (YOUNG 1977: Figs. 199h, 201r, 574p, 582h, 600h). Weight=1.

41. Paraphyses, transition stalk-rami: (0) non-membranous (Figs. 17, 29, 48); (1) articulated by membranous area (YOUNG 1977: Figs. 574p, 582h, 600h). Weight=1.

42. Paraphyses, direction of rami, dorsal view: (0) posteriorly (Fig. 17); (1) laterally (Fig. 29); (2) anteriorly (Fig. 48). In ACCTRAN optimization, the laterally directed rami of the paraphyses is a synapomorphy shared by the red *Balacha* with posterior changes to state 0 within *B. distincta* and to the autapomorphic anteriorly directed rami of *B. rubripennis*. In DELTRAN, the laterally directed rami originated independently in *B. lepida* and within *B. distincta*. Weight=0.

43. Aedeagus, direction of shaft from base of dorsal apodeme, lateral view: (0) directed posteriorly or posterodorsally (YOUNG 1977: Figs. 146p, 146f, 152f, 199f, 201f, 574p, 582f, 600f, 606f, 606p); (1) directed anteriorly, curving drastically 180 degrees, apex directed caudally (Figs. 4, 16, 28, 34, 47, 59). Weight=1.

44. Aedeagus, dorsal apodemes originating from base of shaft, lateral view: (0) membranous (Figs. 4, 16, 28, 34, 47, 59); (1) sclerotized and elongate (YOUNG 1977: Figs. 146f, 146p, 152f, 199f, 201f, 600f, 606f, 606p). The membranous dorsal apodemes of aedeagus shaft is a homoplastic synapomorphy shared by *Sibovia* species.

45. Aedeagus, shaft cross-section: (0) round; (1) vertically linear (Fig. 77). The laterally compressed shaft is a synapomorphy of the *Caragonalia* species studied herein. Weight=1.

46. Aedeagus, shaft length, lateral view: (0) short, less than 15 times its largest width (Figs. 28, 34, 59); (1) elongate, more than 15 times its largest width (Figs. 4, 16, 47). The very elongate shaft has originated independently three times, as autapomorphies of *B. decorata* and Cicadellini n. gen. n. sp., and as a synapomorphy shared by *B. distincta* + *B. rubripennis*.

47. Aedeagus, texture of shaft: (0) without sculpturing (Figs. 4, 28, 34, 59); (1) presenting rows of small dentiform processes dorsally that may extend laterally (Figs. 16, 47). In ACCTRAN optimization, an aedeagus shaft without sculpturing is a synapomorphy of *Balacha* species with a posterior change to a shaft presenting small tegumentary processes in the *B. distincta* + *B. rubripennis* clade. In addition to the latter synapomorphic trait, independent origins of tegumentary processes on the shaft are favored as autapomorphies of *Pegogonia rufipes* and of Cicadellini n. gen. n. sp. in the DELTRAN optimization.

48. Aedeagus, dorsal margin of shaft, lateral view: (0) without projection (Figs. 4, 16, 28, 34, 47, 59); (1) expanded into broad dorsal lobe (YOUNG 1977: Figs. 199f, 201f). The dorsal lobe is a synapomorphy of *Caragonalia*. Weight=1.

49. Aedeagus, ventral margin of shaft, lateral view: (0) without processes (Figs. 4, 16, 28, 34, 47, 59); (1) with pair of elongate processes extending farther posteriorly than apex of shaft (YOUNG 1977: Figs. 600f, 600g, 600p, 606f, 606p). This pair of elongate processes on ventral margin of shaft is a synapomorphy shared by the *Pawiloma* species studied herein, but it is not present in all *Pawiloma* species. Weight=1.

50. Aedeagus, apex: (0) without processes (YOUNG 1977: Figs. 146f, 146p, 152f, 199f, 201f, 574p, 582f, 600f, 606f); (1) presenting pair of processes (Figs. 4, 16, 28, 34, 47, 59). Weight=1.

51. Aedeagus, articulation of pair of apical processes with shaft: (0) continuously sclerotized from laterodorsal margin (Fig. 6); (1) continuously sclerotized from ventral

margin (Figs. 36, 61); (2) articulated by membranous area (Figs. 18, 30, 49). State 1 is a synapomorphy shared by *B. melanocephala* + *B. similis* and state 2 is a synapomorphy shared by the red *Balacha*. Weight=1.

52. Aedeagus, pair of apical processes, sculpturing: (0) without processes (Figs. 6, 30, 36, 49, 61); (1) with small dentiform processes (Fig. 18). The small dentiform processes on the apical processes of the aedeagus are an autapomorphy of *B. distincta*.

Female genitalia

53. Female sternite VII, disc surface, ventral view: (0) convexly plane (Figs. 10, 39, 64); (1) presenting median longitudinal elevated fold (Figs. 22, 53). The median longitudinal fold on female sternite VII originated independently as an autapomorphy of Cicadellini n. gen. n. sp. and a synapomorphy of *B. distincta* + *B. rubripennis*.

54. Female sternite VII, maximum length, lateral view: (0) longer than maximum pygofer length (Figs. 20, 51); (1) shorter than maximum pygofer length (Figs. 8, 40, 65). The elongate sternite VII also originated independently as a synapomorphy of *B. distincta* + *B. rubripennis* and an autapomorphy of Cicadellini n. gen. n. sp.

55. Female sternite VII, median portion of posterior margin, ventral view: (0) straight, not projected posteriorly beyond lateral regions (Figs. 10, 39); (1) presenting deep narrow concavity (Figs. 22, 53); (2) presenting posterior projection extending beyond lateral regions (Fig. 80); (3) presenting shallow broad concavity (YOUNG 1977: Figs. 199i, 201i); (4) presenting shallow narrow concavity (Fig. 64). The presence of a deep narrow concavity on the posterior margin is a homoplastic synapomorphy of *B. distincta* + *B. rubripennis* and the presence of a shallow broad concavity is also a homoplastic synapomorphy of *Sibovia* species. A shallow narrow concavity is an autapomorphy of *B. similis*.

56. First valvifers, posterodorsal margin, lateral view: (0) broadly convex (TAKIYA **et al.** in prep.: Fig. 8); (1) slightly concave mesally (Figs. 20, 51); (2) presenting distinct concavity on posterior half (Figs. 8, 38, 65); (3) presenting posterior acute triangular projection (Fig. 79). The presence of a distinct concavity on posterior half of posterodorsal margin of the first valvifer is a synapomorphy of the black *Balacha*. The presence of a posterior acute projection is a possible homoplastic synapomorphy of *Amblyscarta* species and it has originated independently as an autapomorphic trait in *Pegogonia rufipes*. In DELTRAN optimization, the concave margin is a synapomorphy shared by *B. distincta* + *B. rubripennis*.

57. First valvulae of ovipositor, anterior margin of base, ventral view: (0) presenting distinct concavity (Figs. 22, 53); (1) obliquely straight (Figs. 10, 39, 64); (2) inner margin anterodorsally projected (Fig. 78). The distinct concavity on anterior margin of first valvulae is a synapomorphy shared by *B. distincta* + *B. rubripennis* and is independently originated in Cicadellini n. gen. n. sp. The anteriorly projected inner margin is a synapomorphy shared by the *Pawiloma* species studied herein.

58. Female internal abdominal sternite VIII, dorsal view: (0) membranous (Figs. 9, 38, 63); (1) sclerotized (Figs. 21, 52). The loss of the internal abdominal sternite VIII is a synapomorphy of the black *Balacha* clade.

59. Female internal abdominal sternite VIII, aspect, dorsal view: (0) forming single plate (Figs. 21, 52); (1) forming double hinged plate (YOUNG 1977: Fig. 592r). The modified internal abdominal sternite VIII into a double hinged plate is an autapomorphy of *Pegogonia rufipes*.

60. Female internal abdominal sternite VIII, length, dorsal view: (0) shorter than wide (Figs. 21, 52); (1) longer than wide (Fig. 81). The long abdominal internal sternite VIII is a

homoplastic synapomorphy shared by *Pawiloma* species and is independently originated in *Pegogonia rufipes*.

61. Female internal abdominal sternite VIII, posterior margin, dorsal view: (0) convex (Fig. 81); (1) straight (YOUNG 1977: Fig. 592r); (2) broadly concave (Figs. 21, 52). The convex posterior margin of the internal abdominal sternite VIII is a synapomorphy shared by *Pawiloma* species and the straight margin is an autapomorphy of *Pegogonia rufipes*. Weight=1.

62. Female pygofer, apex, lateral view: (0) round (Figs. 20, 40, 51, 65); (1) acute (Fig. 8). The acute apex of the pygofer originated at least three times as autapomorphies of *Pawiloma ancora*, *Caragonalia tarsalis* and *Balacha decorata*. It is also a possible autapomorphy of *Amblyscarta stillifera*. Weight=0.

63. Gonoplacs, apex, lateral view: (0) round (Figs. 20, 40, 51, 65); (1) acute (Fig. 8). The acute apex of the gonoplacs is an autapomorphy of *B. decorata*.

64. Second valvulae of ovipositor, aspect of continuous teeth, lateral view: (0) gradually declivous posteriorly (Fig. 82); (1) anterior half presenting dorsal projection (Figs. 12, 24, 41, 55, 66). The presence of the dorsal projection on the anterior half of a tooth is a homoplastic synapomorphy shared by *Balacha* species and is independently originated in *Pawiloma* species. It is also a possible synapomorphy for *Amblyscarta* species.

Cladistic analysis

The cladistic analysis of the genus *Balacha* resulted in two equally parsimonious trees presenting length = 141, consistency index (CI) = 0.638 (0.570 excluding parsimony uninformative characters), retention index (RI) = 0.738, and rescaled consistency index (RC) = 0.471. A strict consensus tree of both trees (Fig. 83) presented length = 142, CI = 0.634 (0.566 excluding parsimony uninformative characters), RI = 0.733, and RC = 0.465. Apomorphies for clades found on the consensus tree are listed in Table II. The difference

between the two trees is in the position of the *Caragonalia* species clade (*C. carminata* + *C. tarsalis*) and the *Pawiloma* species clade (*P. ancora* + *P. victima*). In one tree, *Caragonalia* is positioned as the sister group of clade 8 (clade designation in Fig. 83), while in the other *Pawiloma* is positioned as the sister group of clade 8. The successive weighting analysis resulted in a single most parsimonious tree with the same topology as the equal-weights one which places *Caragonalia* as the sister group of clade 8. The monophyly of the genus *Balacha* is supported in all most parsimonious trees found in the analyses. Jackknife estimates and Bremer support indices for the clades supported on the strict consensus tree are specified in Fig. 83.

DISCUSSION

The presence of a female internal abdominal sternite VIII in some *Balacha* species (Figs. 21, 52), as well as in the *Pawiloma* species (Fig. 81) studied, is herein reported for the first time. Although many Cicadellinae workers don't usually describe this structure, it has been found that it can bear shape-related characteristics that are apparently useful for species distinctions in the subfamily (NIELSON 1965, MEJDALANI 1995, MEJDALANI & EMMRICH 1998, TAKIYA **et al.** 1999). CAVICHIOLI (1997) was the first to publish an analysis resolving phylogenetic relationships in the Cicadellinae using female genitalic characters, two involving external structures (pygofer and sternite VII) and a single one of the internal genitalia (second ovipositor valvulae). Herein characters of the internal female genitalia (valvifers, first and second valvulae, sternite VIII) are used more extensively, and proved to be useful in providing reliable synapomorphies of the major lineages of *Balacha*.

The monophyly of the genus *Balacha* was supported in the two most parsimonious trees found in the analysis, although it received very low branch support scores both in the jackknife and Bremer support index (Fig. 83). *Balacha* can be defined based on the

synapomorphic traits present in the genus groundplan, like the anteriorly produced crown with a subangulate anterior margin (char. 5, state 1, Figs. 2, 14, 26, 32, 44, 45, 57, 69), crown-frons transition forming an approximately distinct acute angle (char. 3, state 1, Fig. 70), flattened pronotum continuing contour of head and mesonotum in lateral view (char. 16, state 1, Fig. 70), round style apices (char. 37, state 0, only in ACCTRAN) (Figs. 5, 17, 29, 48), aedeagus shaft without cuticular sculpturing (char. 47, state 0, Figs. 4, 28, 34, 59), and teeth of second valvulae of ovipositor presenting an anterior dorsal projection (char. 64, state 1, Figs. 12, 24, 41, 55, 66). The genus *Balacha* comprises two major lineages that are well supported by synapomorphies and branch support scores: the red *Balacha* clade (discussed in the taxonomic notes on *B. lepida*) including *B. lepida* (*B. distincta* + *B. rubripennis*), and the black *Balacha* clade (discussed in the taxonomic notes on *B. decorata*) including *B. decorata* (*B. melanocephala* + *B. similis*).

The results of the cladistic analysis support YOUNG's (1977) view that *Balacha* is very closely related to *Pegogonia*. The curvature of the aedeagus (char. 43, state 1, Figs. 4, 16, 28, 34, 47, 59) and the multiseriate macrosetae on subgenital plates (char. 32, state 0, Figs. 19, 31, 50), which YOUNG (1977) cites as similarities between both genera, are actually synapomorphies shared also with Cicadellini n. gen. n. sp. (TAKIYA **et al.** in prep.). Unambiguous synapomorphies shared only by *Balacha* and *Pegogonia* are the parallel-sided pronotum (char. 14, state 1, Figs. 2, 14, 26, 32, 44, 45, 57, 69), presenting width less than transocular width of crown (char. 15, state 1, Figs. 2, 14, 26, 32, 44, 45, 57, 69), and the straight posterior margin of the female sternite VII (char. 55, state 0, Figs. 10, 39). The latter synapomorphy is probably what YOUNG (1977) meant by "non-produced abdominal sternum VII", which he believed to be another shared similarity between both genera. CAVICHIOLI & SAKAKIBARA (1988) mention as *Balacha* diagnostic characteristics combined plesiomorphic and apomorphic features, the latter being the produced crown

with subangulate anterior margin, which also is referred by YOUNG (1977) as the marked difference between *Balacha* and *Pegogonia* (the latter presenting a short crown with a broadly round anterior margin). All the characters YOUNG (1977) discussed in the positioning of *Balacha* near *Pawiloma* and *Sibovia* were found to be primarily non-homologous features as the decurved aedeagal shaft or apical processes on aedeagus shaft, secondarily non-homologous ones like the unproduced posterior margin of sternum VII of female, or invariant characters like the shape of second valvulae of ovipositor.

YOUNG (1977) was in doubt about the placement of *Caragonalia* in the *Erythrogonia* generic group. The present analysis supports well this placement, but it would be necessary a more thorough analysis including more representative species of a higher number of genera to generate a more concrete hypothesis. The undescribed Cicadellini genus and species (TAKIYA **et al.** in prep.) most probably belongs to this generic subjective grouping.

Balacha species are distributed on higher latitudes in Uruguay, Argentina and southern Brazil (Paraná and Rio Grande do Sul states), and apparently when distributed on lower latitudes (São Paulo, Rio de Janeiro and Minas Gerais states) they are found on higher altitudes. The leafhopper genus distribution pattern (Fig. 84) is probably related to the host plant distribution. Apparently all *Balacha* species use the sea hollies, *Eryngium* (Apiaceae), as host plants. YOUNG (1977) studied one *B. melanocephala* specimen which was collected on *Eryngium* at Uruguay. CAVICHIOLI & SAKAKIBARA (1988) collected *B. melanocephala* and *B. similis* on one unidentified *Eryngium* at Paraná and Rio Grande do Sul states, probably *E. horridum*, a widespread plant on open fields in southern Brazil, on which DMT collected some *B. similis* specimens at Rio Grande do Sul State. DMT also collected *B. similis* specimens on *E. eurycephalum* (Fig. 84) at Minas Gerais State. In this locality, interestingly, *E. eurycephalum* plants are only distributed above approximately

1,900m (DMT, pers. obs.). The other *Balacha* species were also collected on other *Eryngium* species (R. R. Cavichioli, pers. comm.) at southern Brazil.

Although there are no records on host plants for the outgroup taxa, with the exception of Cicadellini n. gen. n. sp. (TAKIYA **et al.** in prep.) collected on *Senecio icoglossus* (Asteraceae) at Minas Gerais State and *Sibovia sagata* collected on the ornamental *Coleus* sp. (Lamiaceae) at São Paulo and Rio de Janeiro states (but probably found on other host plants), we believe that the shift to an *Eryngium* host occurred with the ancestral of all recent *Balacha* species. Morphological synapomorphies of the genus *Balacha*, as the transition crown-frons acute and the straight pronotum, both giving a dorsoventral flattened aspect to the leafhopper, as well as the general small size (when compared to most outgroup taxa), are probably related to this change in host plant usage. As discussed in TAKIYA **et al.** (in press), other Neotropical Cicadellinae leafhoppers presenting this flattened aspect are also apparently related to an Apiaceae host plant, living in between the rosette-disposed leaves.

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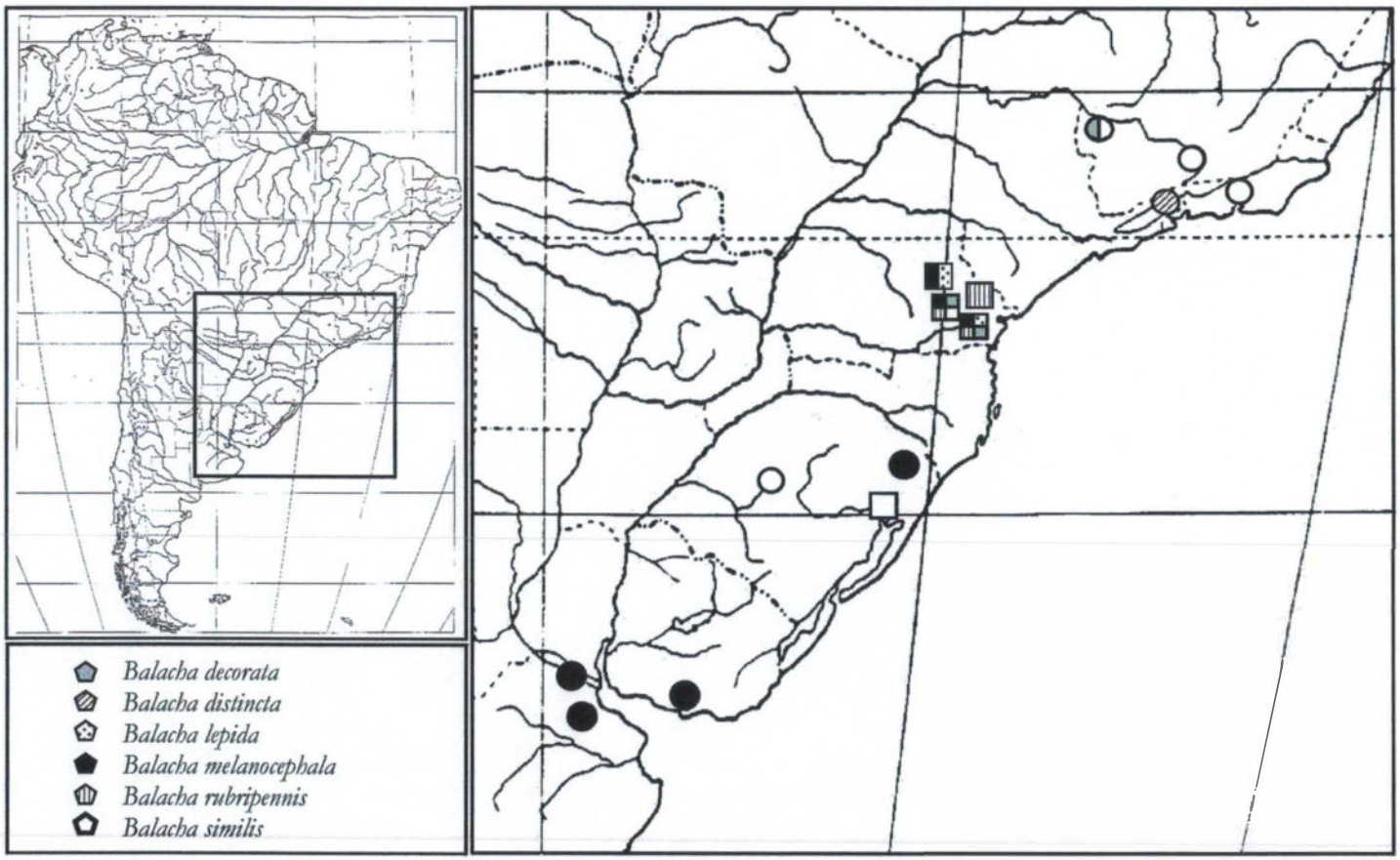
Table I, character state matrix for the cladistic analyses of the genus *Balacha* Melichar (in bold type) and outgroup taxa. –: codes for inapplicable data, ?: for unavailable or doubtful data.

Taxa	Characters						
	0 1	2	3	4	5	6	
	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234
Amblyscarta stillifera	0000000000	0011100000	0000002100	01010210--	--01000000	--002310--	-101
Amblyscarta invemusta	0000000000	0011100000	0000002110	00000210--	--01000000	--002310--	-001
Amblyscarta bicincta	0000000000	0011100000	2000002110	01010210--	--01000000	--002310--	-001
Pawiloma victima	0000100000	0010000000	?000000001	0101110101	1001000010	--01212101	0001
Pawiloma ancora	0100000000	0010100000	1010000001	01011220--	--01000010	--01102101	0101
Sibovia sagata	1010100000	1000010000	0000000000	0101101101	1000000000	--010010--	-000
Sibovia picchitula	1010100000	1000010000	0000000000	0101101101	1000000000	--013010--	-000
Caragonalia tarsalis	0100000000	0010000000	1010000010	0101111101	0001100100	--01301100	2100
Caragonalia carminata	0100000000	0010000000	1000003010	0101111101	0001100100	--01301100	2000
Cicadellini n. gen. n. sp.	0100000000	0010000000	1010000000	0000123100	0010011001	0010100100	2000
Pegogonia rufipes	0100000000	0001100010	2000100000	00?0111100	0010001001	0001031111	1000
Balacha decorata	0111100000	0011110010	2201001000	011011011-	--10010001	20010210--	-111
Balacha distincta	0111101100	0111110000 1 1	1010010000 1	0000020100	0010011001 1	2110110100	2001
Balacha lepida	0111110011 1	0111111101	1000010010	0010110100	0110000001	20--------	----
Balacha melanocephala	0111100000	0011110010	2101100000	01101110--	--10000001	10010210--	-001
Balacha rubripennis	0111101110	0111110001 1	1010010010	0000020100	0210011001	2010110100	2001
Balacha similis	0111100000	0011110000 1	2000000000 1 11	11101110--	--10000001	10014210--	-001

Table II, apomorphy list for clades of the consensus tree (Fig. 83) resulted from the cladistic analysis of the genus *Balacha* Melichar, optimized using the ACCTRAN criterium. Non-homoplastic apomorphies in bold type.

Clades or terminal taxa	Apomorphies
1	62(0)
2	29(1)
Amblyscarta invenusta	34(0), 32(0)
Amblyscarta bicincta	21(2)
3	14(0), 15(0), **27(0)**, **28(0)**, 35(1), 36(1), 38(1), 54(1), 55(0), 56(0), 64(0)
Sibovia	**1(1)**, 3(1), 5(1), **11(1)**, 13(0), 16(1), 36(0), 41(1), 44(0)
Sibovia picchitula	55(3)
5	**2(1)**, 21(1), 55(1), 58(1)
Pawiloma	**30(1)**, 37(0), 41(1), **49(1)**, 57(2), 60(1), **61(0)**, 64(1)
Pawiloma victima	5(1), 55(2), 56(1)
Pawiloma ancora	15(1), 23(1), 36(2), 37(2), 38(0), 62(1)
Caragonalia	29(1), **45(1)**, **48(1)**, 55(3)
Caragonalia tarsalis	23(1), 62(1)
Caragonalia carminata	**27(3)**
8	34(0), 32(0), **40(0)**, **43(1)**, 44(0), 47(1), **50(1)**
Cicadellini n. gen. n. sp.	23(1), 36(2), 37(3), 46(1), 53(1), 54(0), 57(0)
9	14(1), 15(1), 19(1), 21(2), 33(1), 55(0), 56(1)
Pegogonia rufipes	13(0), 25(1), 56(3), **59(1)**, 60(1), **61(1)**
Balacha	3(1), **4(1)**, 5(1), 16(1), 37(0), 42(1), 47(0), 64(1)
Black *Balacha* clade (11)	**22(1)**, 24(1), 32(1), **39(1)**, 56(2), 58(0)
Balacha decorata	**22(2)**, **27(1)**, 46(1), 62(1), **63(1)**
13	25(1), 37(1), 38(0), **51(1)**
Balacha similis	**31(1)**, 55(4)
Red *Balacha* clade (12)	8(1), **9(1)**, **12(1)**, 18(1), 19(0), 20(1), 21(1), **26(1)**, 29(1), **51(2)**, 53(1), 54(0), 55(1), 57(0)
Balacha lepida	**6(1)**, **10(1)**, **17(1)**
14	**7(1)**, 23(1), 33(0), 35(0), 36(2), 46(1), 47(1)
Balacha distincta	**52(1)**
Balacha rubripennis	42(2)

Fig. 1, distribution map of species of the genus *Balacha*: squares represent records found in the literature and circles new records based on male specimens.


Balacha decorata
Balacha distincta
Balacha lepida
Balacha melanocephala
Balacha rubripennis
Balacha similis

Figs. 2-7, *Balacha decorata* Cavichioli & Sakakibara. **Fig. 2,** dorsal habitus of male holotype. **Figs. 3-7,** male genitalia. **Fig. 3,** pygofer, anal tube, valve, subgenital plate, style, aedeagus, and paraphyses, lateral view. **Fig. 4,** aedeagus, lateral view. **Fig. 5,** connective, style, and paraphyses, dorsal view. **Fig. 6,** detail of aedeagus apex, ventral view. **Fig. 7,** valve and subgenital plate, ventral view.

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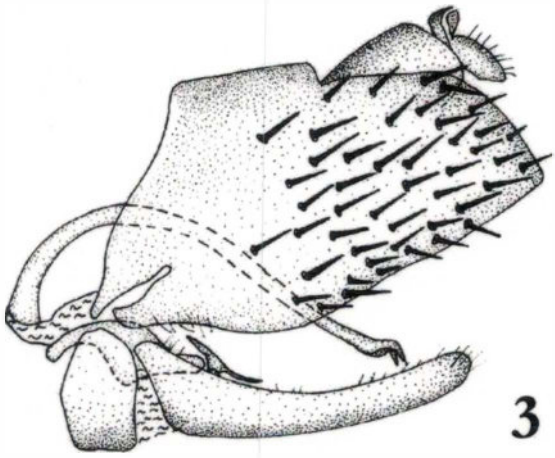

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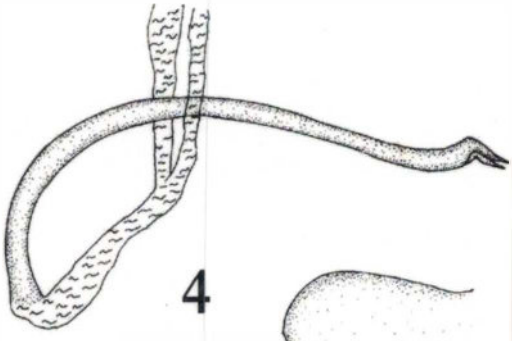

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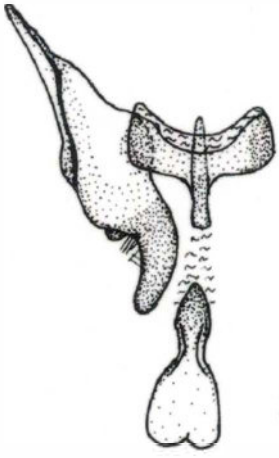

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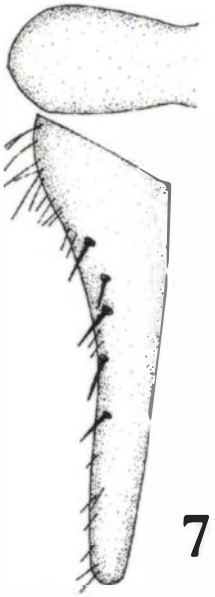

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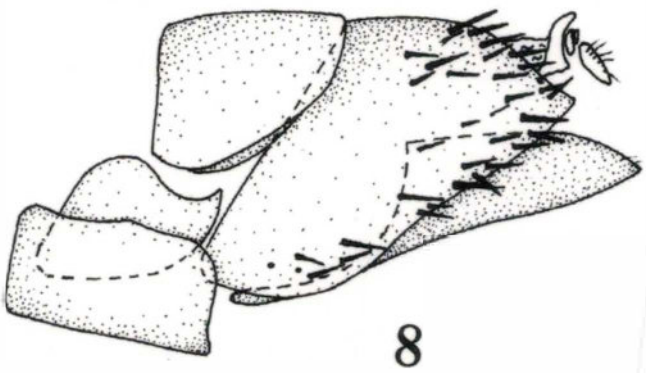
Figs. 8-13, *Balacha decorata* Cavichioli & Sakakibara, female genitalia. **Fig. 8,** sternite VII, first valvifer, tergite VIII, pygofer, gonoplac, and anal tube, lateral view. **Fig. 9,** first valvifers, sternite VII, tergite VIII, pygofer, and anal tube, dorsal view. **Fig. 10,** sternite VII, pygofer, first valvifer on the right and second valvifer on the left, ovipositor valvulae (base of first depicted on the right and base of second on the left), gonangula, and gonoplacs, ventral view. **Figs. 11-13,** second valvula of ovipositor, lateral view. **Fig. 11,** detail of apex. **Fig. 12,** tooth VIII from base. **Fig. 13,** general aspect.



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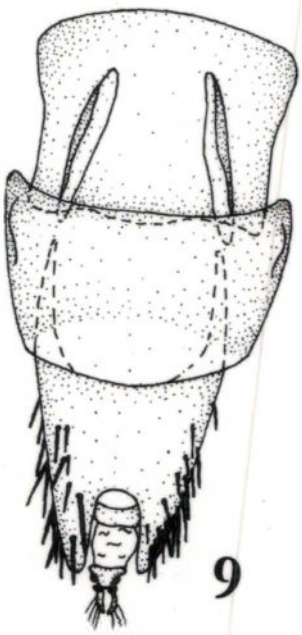

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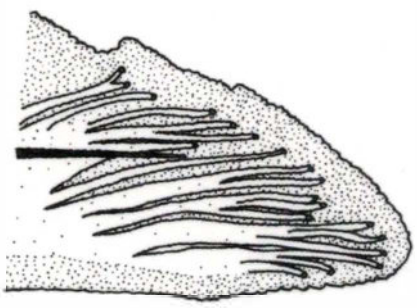

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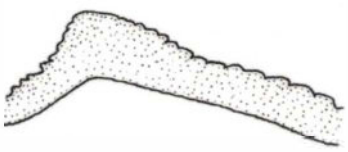

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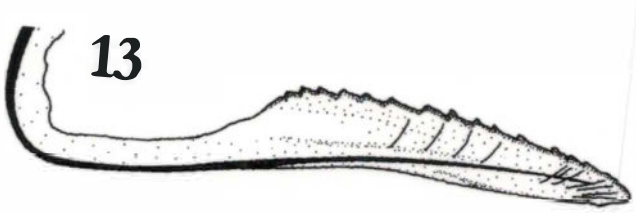

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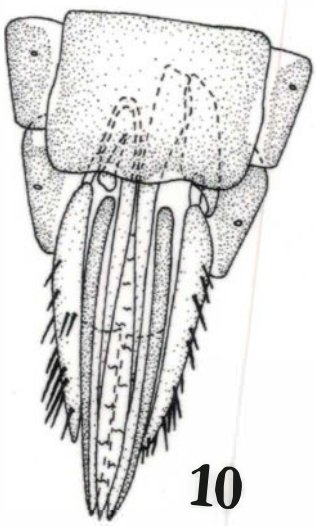

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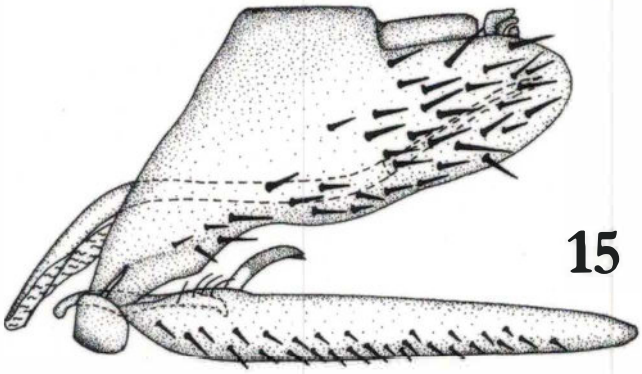
Figs. 14-19, *Balacha distincta* (Signoret). **Fig. 14,** dorsal habitus of male lectotype. **Figs. 15-19,** male genitalia. **Fig. 15,** pygofer, anal tube, valve, subgenital plate, style, aedeagus, and paraphyses, lateral view. **Fig. 16,** aedeagus, lateral view (arrow showing rows of small tegumentary dentiform processes). **Fig. 17,** connective, style, and paraphyses, dorsal view. **Fig. 18,** detail of aedeagus apex, ventral view. **Fig. 19,** valve and subgenital plate, ventral view.

14



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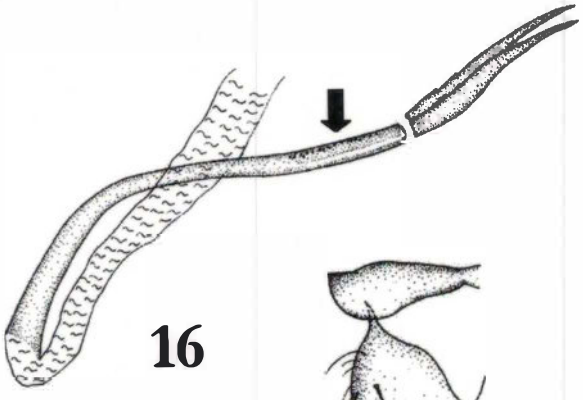

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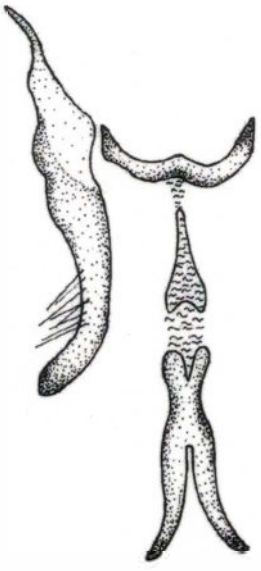

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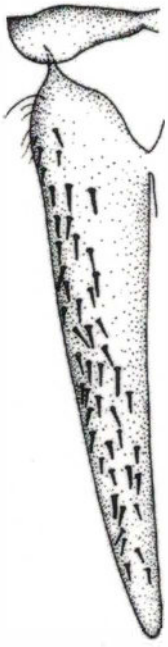

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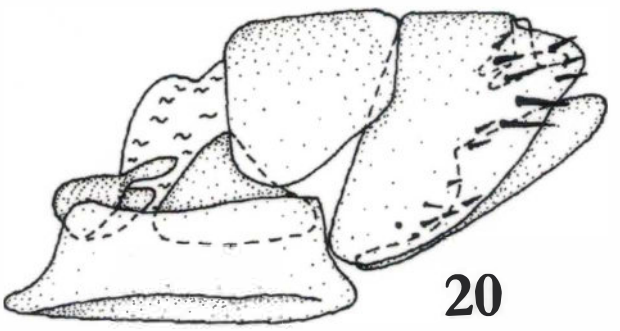
Figs. 20-25, *Balacha distincta* (Signoret), female genitalia. **Fig. 20,** sternite VII, first valvifer, tergite VIII, internal sternite VIII, pygofer, gonoplac, and anal tube, lateral view. **Fig. 21,** first valvifers, sternite VII, tergite VIII, internal sternite VIII, pygofer, and anal tube, dorsal view. **Fig. 22,** sternite VII, pygofer, first valvifer on the right and second valvifer on the left, ovipositor valvulae (base of first depicted on the right and base of second on the left), gonangula, and gonoplacs, ventral view. **Figs. 23-25,** second valvula of ovipositor, lateral view. **Fig. 23,** detail of apex. **Fig. 24,** tooth IX from base. **Fig. 25,** general aspect.



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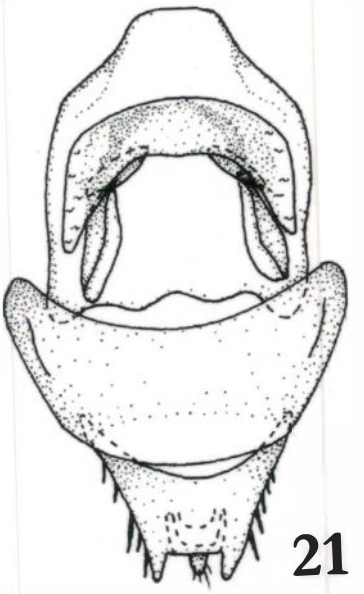

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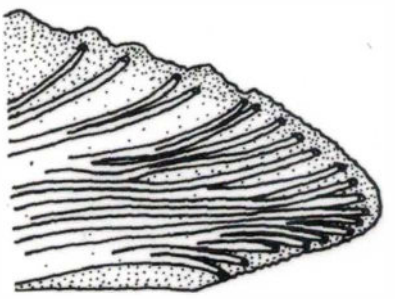

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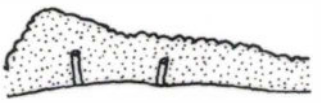

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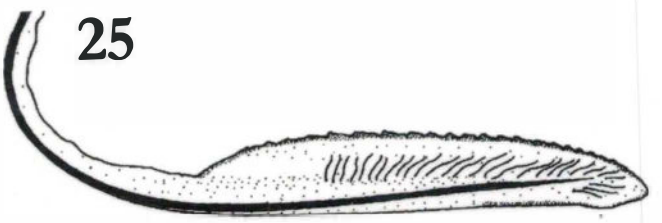

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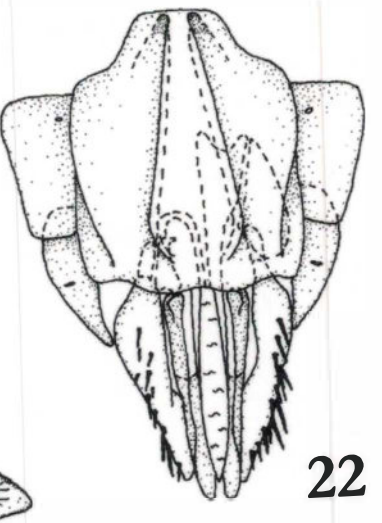

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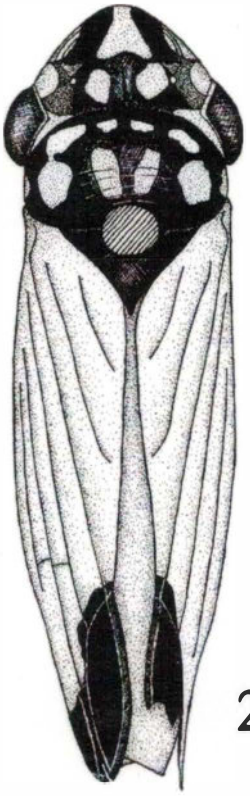
Figs. 26-31, *Balacha lepida* Cavichioli & Sakakibara. **Fig. 26,** dorsal habitus of male holotype. **Figs. 27-31,** male genitalia. **Fig. 27,** pygofer, anal tube, valve, subgenital plate, style, aedeagus, and paraphyses, lateral view. **Fig. 28,** aedeagus, lateral view. **Fig. 29,** connective, style and paraphyses, dorsal view. **Fig. 30,** detail of aedeagus apex, ventral view. **Fig. 31,** valve and subgenital plate, ventral view.



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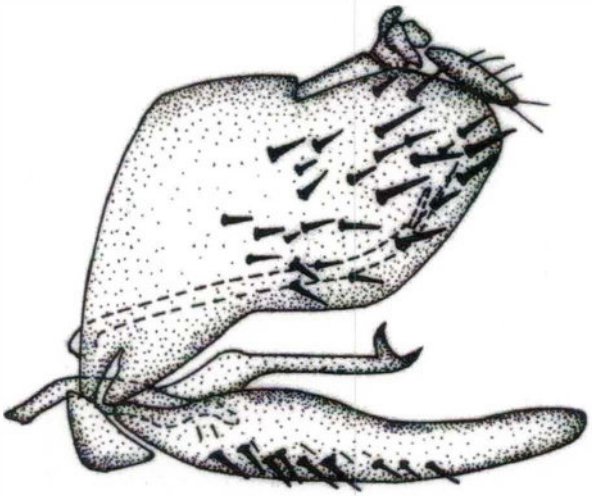

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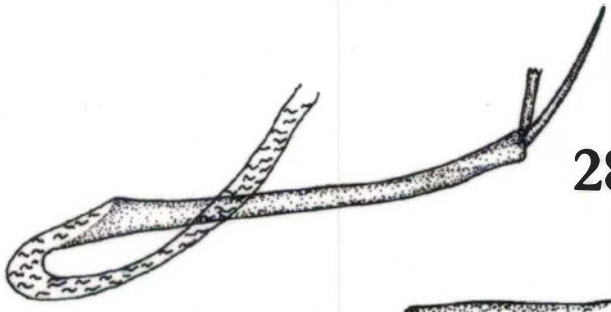

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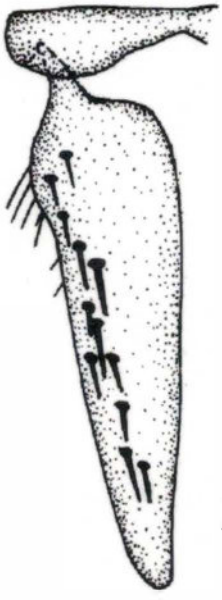

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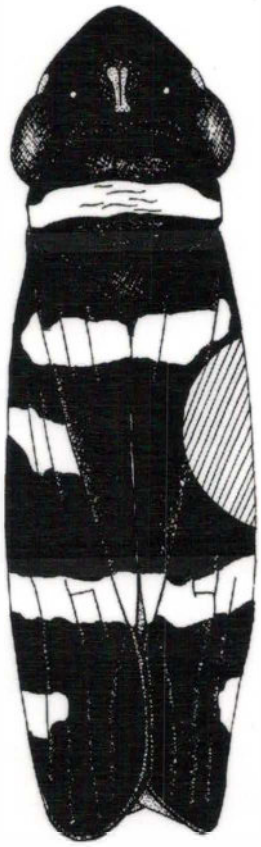
Figs. 32-37, *Balacha melanocephala* (Signoret). **Fig. 32,** dorsal habitus of male neotype. **Figs. 33-37,** male genitalia. **Fig. 33,** pygofer, anal tube, valve, subgenital plate, style, and aedeagus, lateral view. **Fig. 34,** aedeagus, lateral view. **Fig. 35,** connective and style, dorsal view. **Fig. 36,** detail of aedeagus apex, ventral view. **Fig. 37,** valve and subgenital plate, ventral view.



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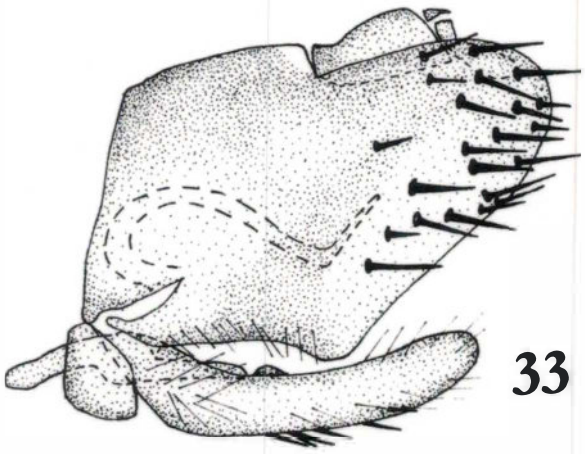

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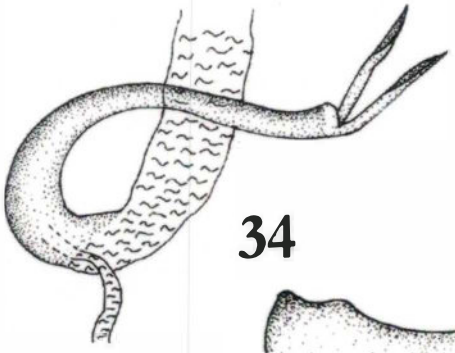

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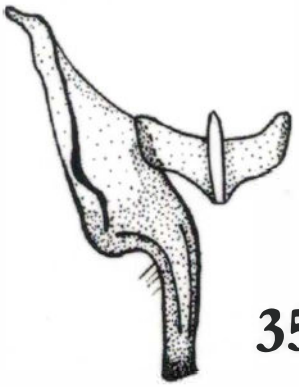

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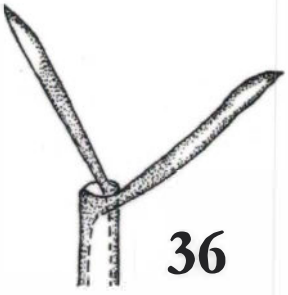

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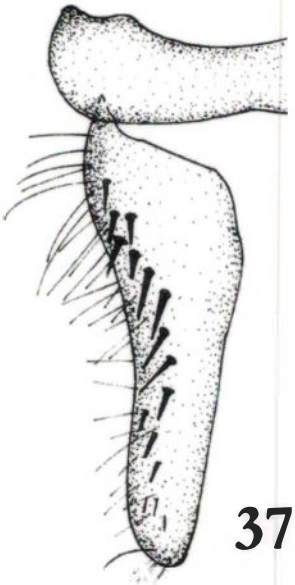

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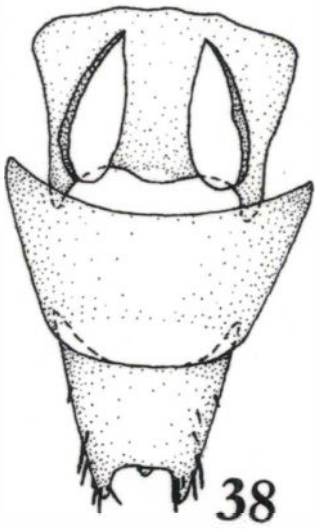
Figs. 38-44, *Balacha melanocephala* (Signoret). **Figs. 38-43,** female genitalia. **Fig. 38,** first valvifers, sternite VII, tergite VIII, pygofer, and apex of anal tube, dorsal view. **Fig. 39,** sternite VII, pygofer, first valvifer on the right and second valvifer on the left, ovipositor valvulae (base of first depicted on the right and base of second on the left), gonangula, and gonoplacs, ventral view. **Fig. 40,** sternite VII, first valvifer, tergite VIII, pygofer, and gonoplac, lateral view. **Figs. 41-43,** second valvula of ovipositor, lateral view. **Fig. 41,** tooth VIII from base. **Fig. 42,** detail of apex. **Fig. 43,** general aspect. **Fig. 44,** dorsal habitus of specimen from Curitiba (Paraná State, DZUP).



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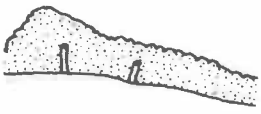

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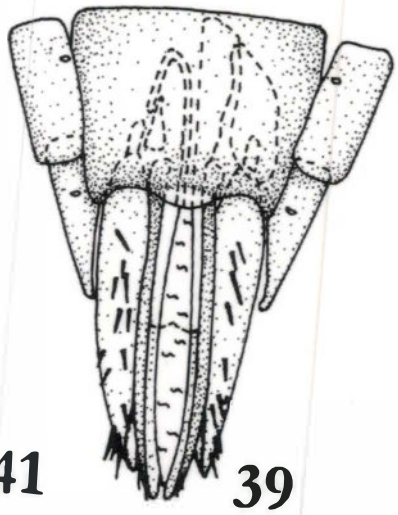

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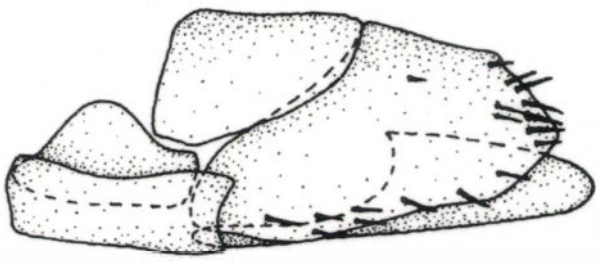

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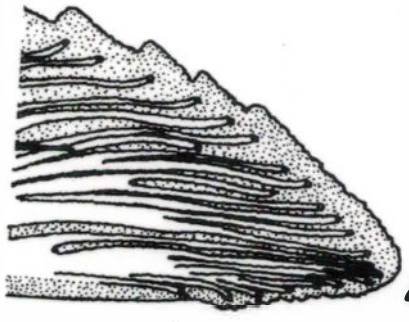

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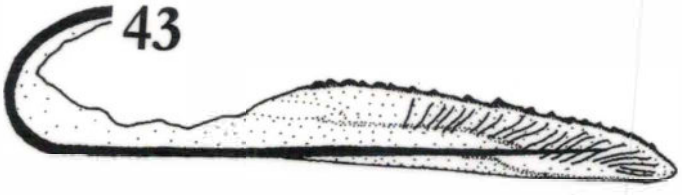

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Figs. 45-50, *Balacha rubripennis* Cavichioli & Sakakibara. **Fig. 45,** dorsal habitus of male holotype. **Figs. 46-50,** male genitalia. **Fig. 46,** pygofer, anal tube, valve, subgenital plate, style, and paraphyses, lateral view. **Fig. 47,** aedeagus, lateral view (arrow showing rows of small tegumentary dentiform processes). **Fig. 48,** connective, style, and paraphyses, dorsal view. **Fig. 49,** detail of aedeagus apex, ventral view. **Fig. 50,** valve and subgenital plate, ventral view.

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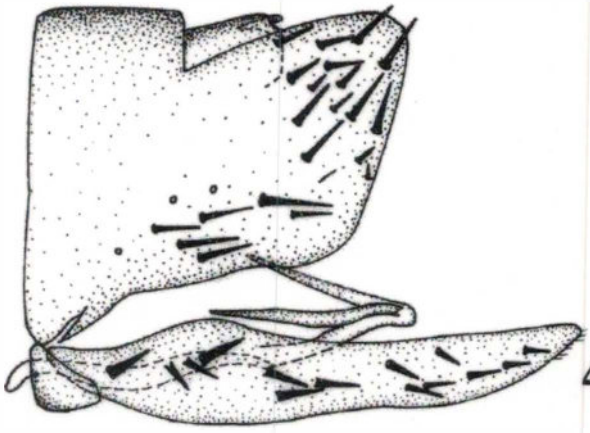

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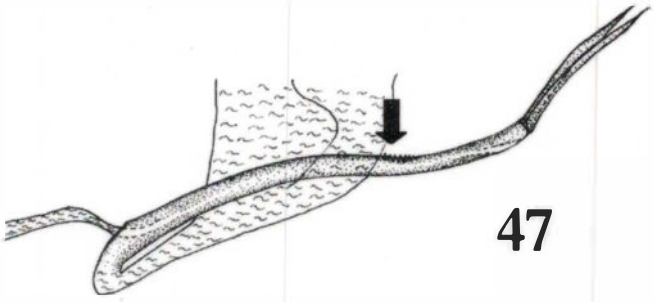

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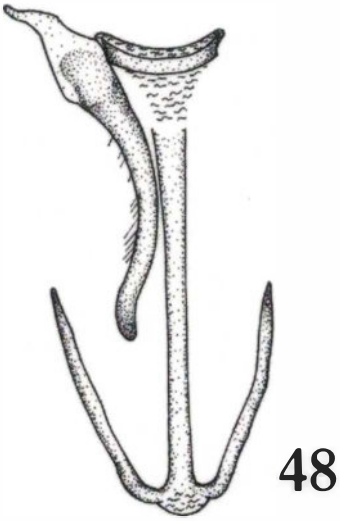

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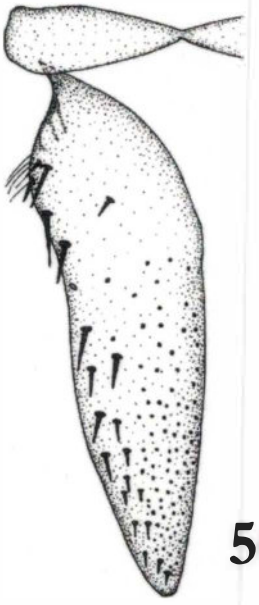

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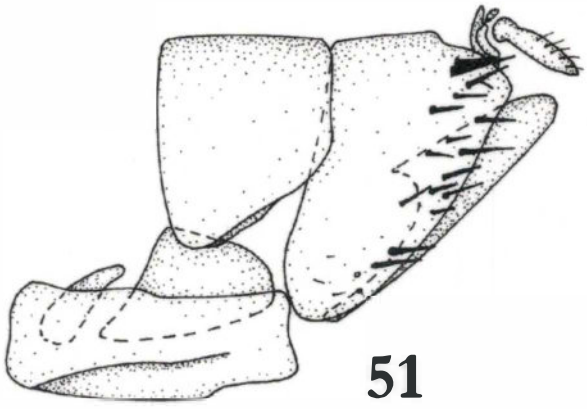
Figs. 51-56, *Balacha rubripennis* Cavichioli & Sakakibara, female genitalia. **Fig. 51,** sternite VII, first valvifer, tergite VIII, internal sternite VIII, pygofer, gonoplac, and anal tube, lateral view. **Fig. 52,** first valvifers, sternite VII, tergite VIII, internal sternite VIII, pygofer, and anal tube, dorsal view. **Fig. 53,** sternite VII, pygofer, first valvifer on the right and second valvifer on the left, ovipositor valvulae (base of first depicted on the right and base of second on the left), gonangula, and gonoplacs, ventral view. **Figs. 54-56,** second valvula of ovipositor, lateral view. **Fig. 54,** detail of apex. **Fig. 55,** tooth VIII from base. **Fig. 56,** general aspect.



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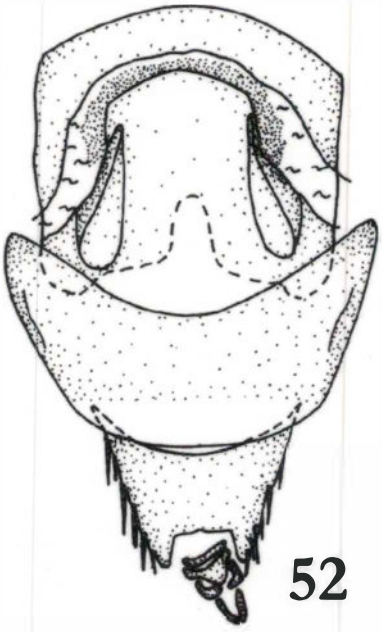

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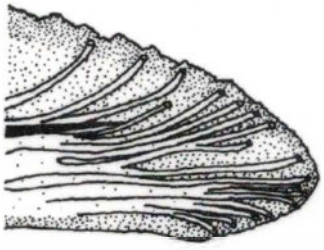

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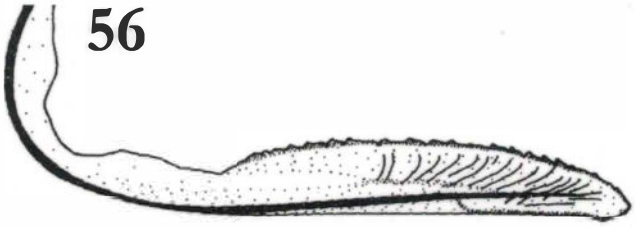

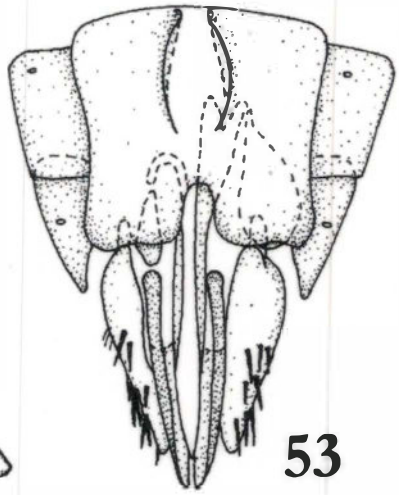

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Figs. 57-62, *Balacha similis* Cavichioli & Sakakibara. **Fig. 57,** dorsal habitus of male holotype. **Figs. 58-62,** male genitalia. **Fig. 58,** pygofer, anal tube, valve, subgenital plate, style, and aedeagus, lateral view. **Fig. 59,** aedeagus, lateral view. **Fig. 60,** connective and style, dorsal view. **Fig. 61,** detail of aedeagus apex, ventral view. **Fig. 62,** valve and subgenital plate, ventral view.

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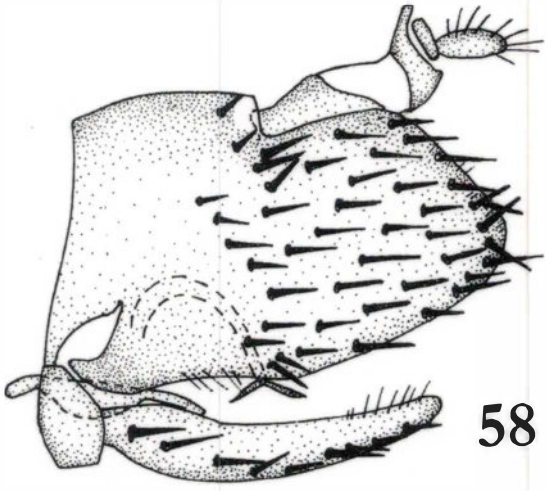

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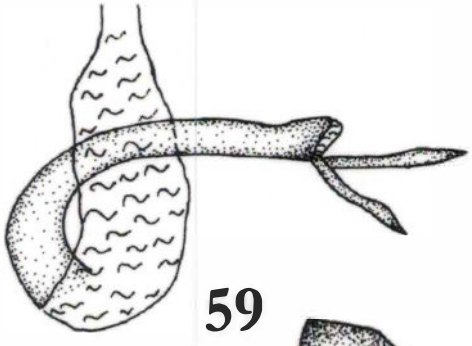

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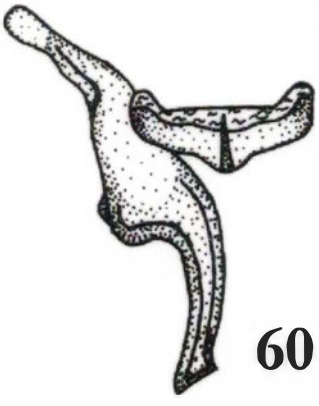

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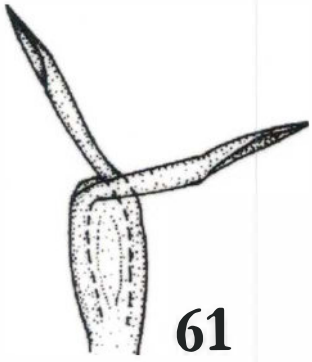

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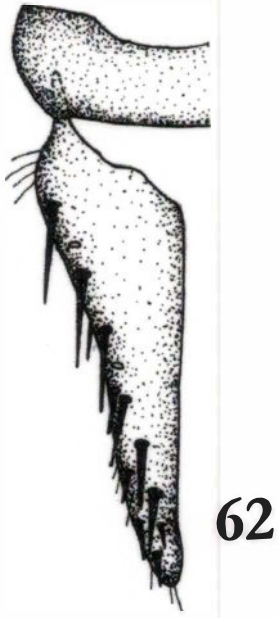

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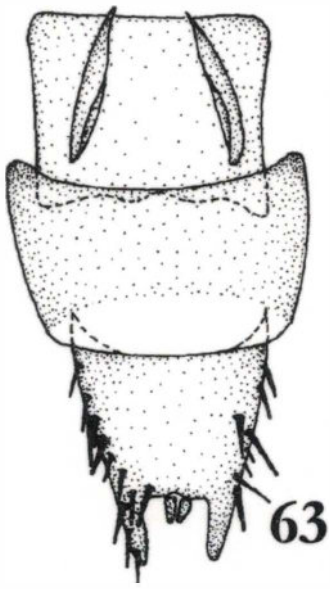
Figs. 63-69, *Balacha similis* Cavichioli & Sakakibara. **Figs. 63-68,** female genitalia. **Fig. 63,** first valvifers, sternite VII, tergite VIII, pygofer, and apex of anal tube, dorsal view. **Fig. 64,** sternite VII, pygofer, first valvifer on the right and second valvifer on the left, ovipositor valvulae (base of first depicted on the right and base of second on the left), gonangula, and gonoplacs, ventral view. **Fig. 65,** sternite VII, first valvifer, tergite VIII, pygofer, gonoplac, and anal tube, lateral view. **Figs. 66-68,** second valvula of ovipositor, lateral view. **Fig. 66,** tooth XIV from base. **Fig. 67,** detail of apex. **Fig. 68,** general aspect. **Fig. 69,** dorsal habitus of specimen from Itamonte (Minas Gerais State, DZRJ).



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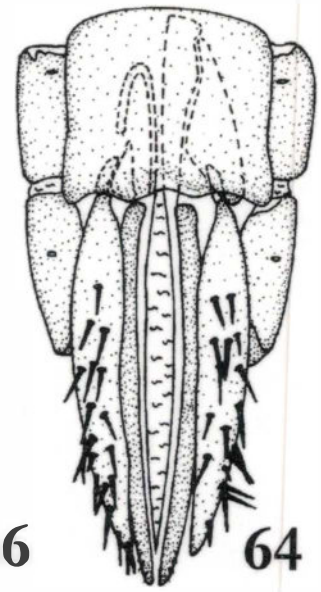

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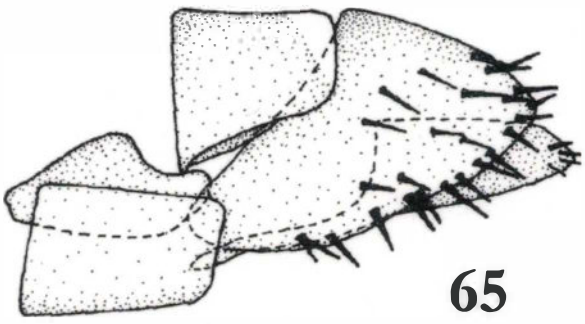

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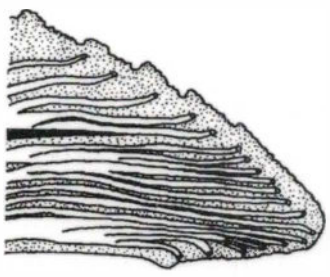

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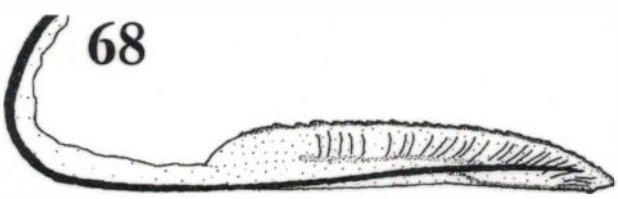

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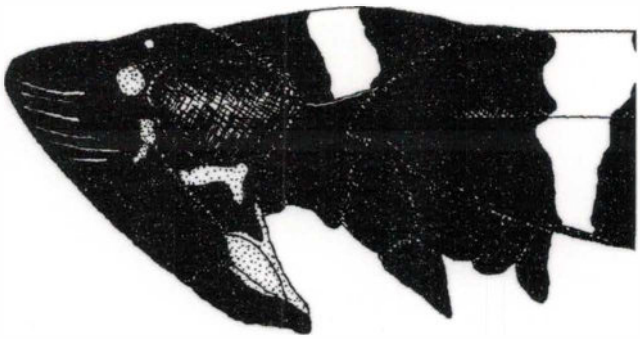
Fig. 70, *Balacha similis* Cavichioli & Sakakibara, lateral view. **Fig. 71,** *Pegogonia rufipes* (Fabricius), lateral view. **Fig. 72,** *Balacha lepida* Cavichioli & Sakakibara, face. **Fig. 73,** *Sibovia sagata* (Signoret), face. **Fig. 74,** *Balacha distincta* (Signoret), hindleg tibia apex and basal tarsomeres (arrow showing modified peg-like setae).



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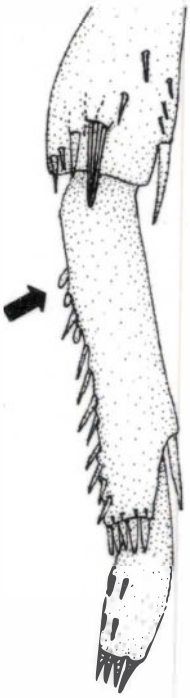

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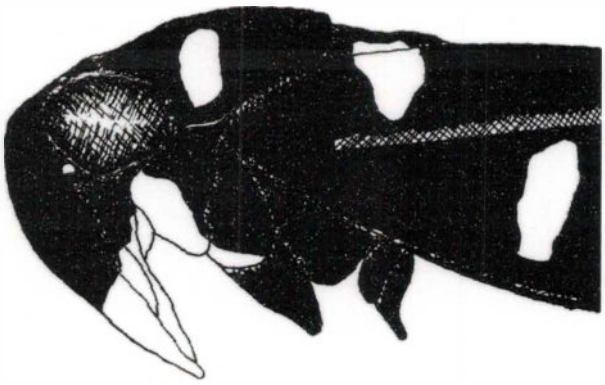

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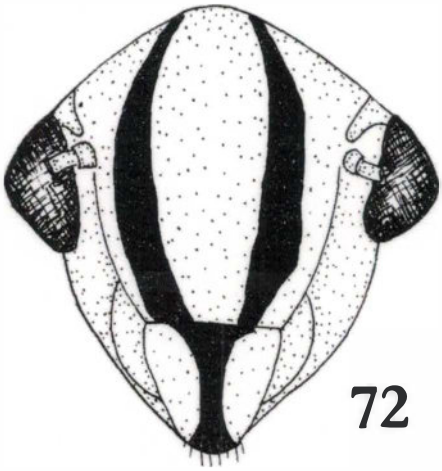

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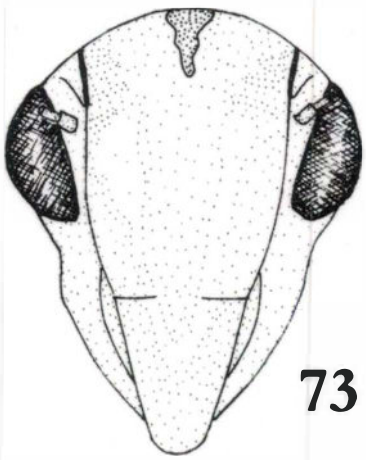

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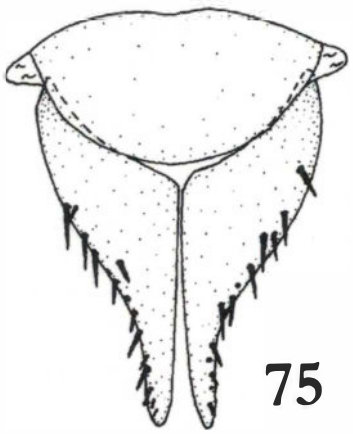
Figs. 75-77, male genitalia in the Cicadellini outgroup taxa. **Fig. 75,** *Amblyscarta bicincta* (Germar), valve and subgenital plates, ventral view. **Fig. 76,** *Pawiloma ancora* Young, valve and subgenital plates. **Fig. 77,** *Caragonalia tarsalis* (Signoret), aedeagus, caudal view. **Figs. 78-82,** female genitalia in the Cicadellini outgroup taxa. **Fig. 78,** *Pawiloma victima* (Germar), first valvifer and base of first valvula of ovipositor, ventral view. **Fig. 79,** *Amblyscarta stillifera* (Stål), first valvifer and base of first valvula of ovipositor, lateral view. **Fig. 80,** *Amblyscarta stillifera*, sternite VII, ventral view. **Fig. 81,** *Pawiloma ancora*, internal sternite VIII, dorsal view. **Fig. 82,** *Pegogonia rufipes* (Fabricius), tooth of second valvula of ovipositor.



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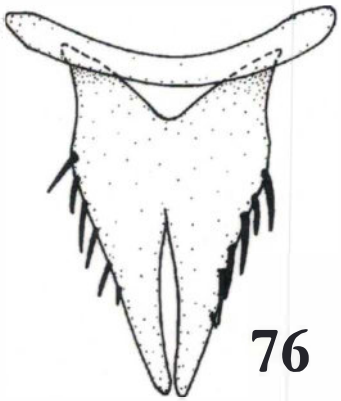

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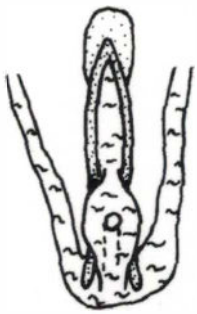

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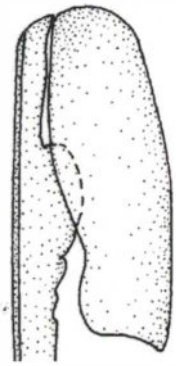

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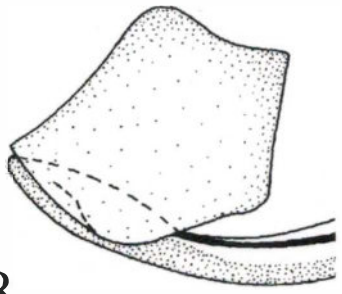

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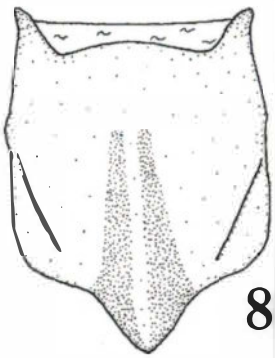

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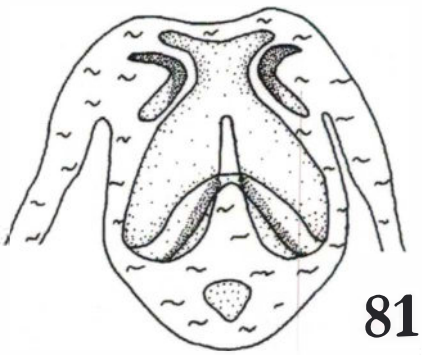

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Fig. 83, unrooted strict consensus of the two most parsimonious trees generated from the cladistic analysis of the genus *Balacha* (length = 142, CI = 0.634, RI = 0.733, RC = 0.465). The *Balacha* species treated as the ingroup are shown in bold type. The numbers inside boxes are clade designations (see Table II) and above boxes are jackknife percentages / Bremer support index for the respective clade.

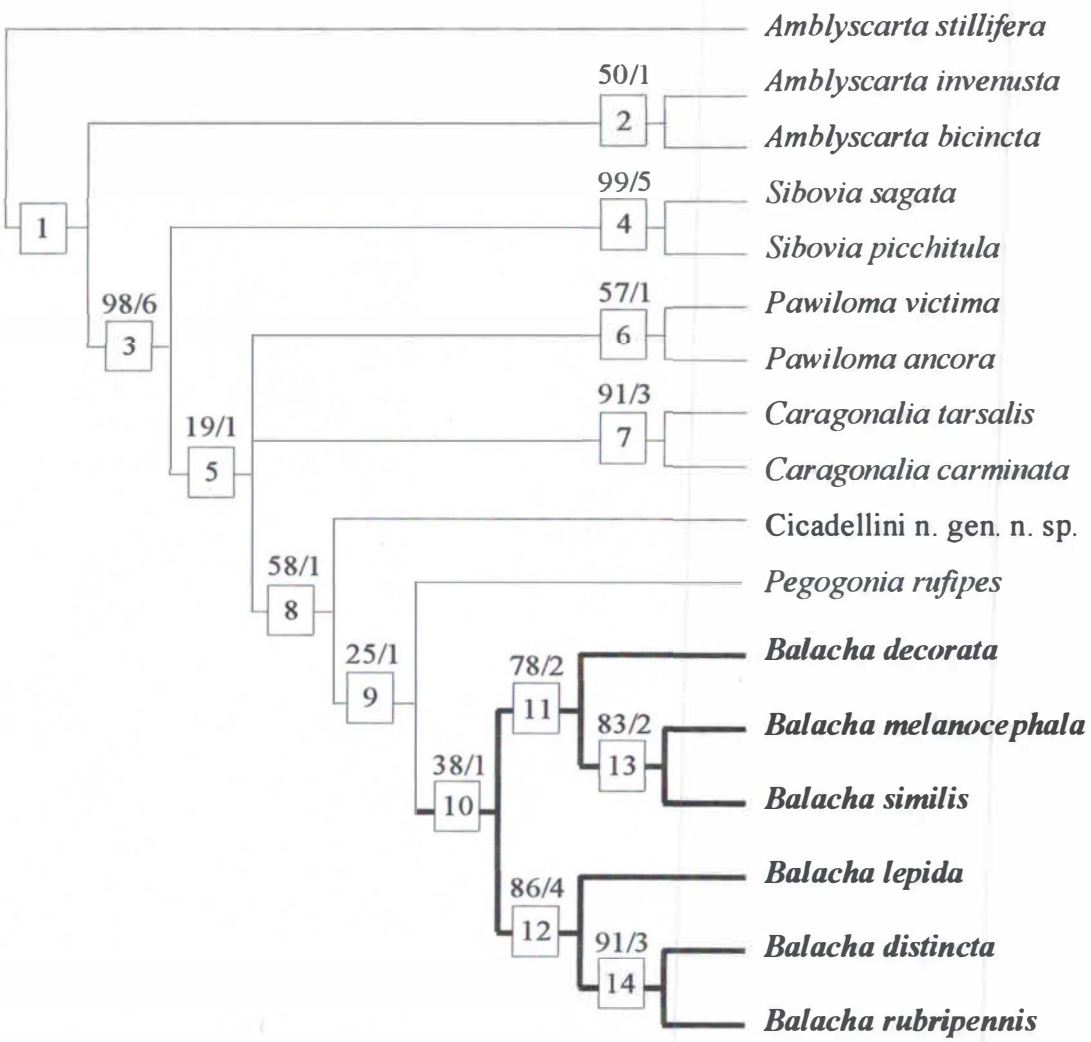
Amblyscarta stillifera
50/1
2
Amblyscarta invenusta
Amblyscarta bicincta
99/5
4
Sibovia sagata
Sibovia picchitula
1
98/6
3
57/1
6
Pawiloma victima
Pawiloma ancora
91/3
7
19/1
5
Caragonalia tarsalis
Caragonalia carminata
Cicadellini n. gen. n. sp.
58/1
8
Pegogonia rufipes
25/1
9
78/2
11
Balacha decorata
83/2
13
Balacha melanocephala
38/1
10
Balacha similis
Balacha lepida
86/4
12
91/3
14
Balacha distincta
Balacha rubripennis

Fig. 84, *Eryngium eurycephalum* (Apiaceae), host plant of *Balacha similis* at Itamonte, Minas Gerais State, area near the entrance of the National Park of Itatiaia [approx. 22°17'S 44°52'W, c. 2,350 m]. Picture taken by A. L. Carvalho in October 1999.

Appendix I, material examined.

The following list refers to specimens examined in the present study. In quotations of label data, a reversed virgule (\) separates lines on a label. Abbreviations for institutions where the material is deposited, with respective curators, are: MNRJ, Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro (Brazil), G. Mejdalani; DZRJ, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro (Brazil), J. L. Nessimian and N. Ferreira-Jr.; DZUP, Coleção Entomológica Pe. Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba (Brazil), R. R. Cavichioli; MZSP, Museu de Zoologia, Universidade de São Paulo, São Paulo (Brazil), E. Cancello; BMNH, Department of Entomology, The Natural History Museum, London (England), M. Webb; MMBC, Department of Entomology, Moravian Museum, Brno (Czech Republic), P. Lauterer; NHMW, Zoologische Abteilung, Naturhistorisches Museum Wien, Vienna (Austria), H. Zettel. Specimens of Cicadellini n. gen. n. sp. studied are listed in TAKIYA **et al.** (in prep.).

Ingroup:

Balacha decorata Cavichioli & Sakakibara

Holotype: 1 ♂ "S[ão]. J[osé dos]. Pinhais [approx. 25°32'S 49°12'W, c. 906m] PR \ Brasil 25/XI/1985 \ Cavichioli leg", DZUP.

Paratypes: 3 ♂ e 6 ♀, same data as holotype, DZUP; 1 ♀, "Curitiba [approx. 25°25'S 49°16'W, c. 934m] – PR \ BR – X-1984 \ A. M. Sakakibara – leg", DZUP; 2 ♀, "S. J. Pinhais PR \ Brasil 22/XI/1985 \ Cavichioli leg", DZUP.

Additional specimens: 2 ♂, "Brasil- Minas Gerais \ Poços de Caldas [approx. 21°47'S 46°33'W, c. 1,200m] \ Retiro dos Carneiros \ 23.VII.1969 J. Becker \ O. Roppa e O. Leoncini cols.", MNRJ.

New record: Minas Gerais State (Brazil).

Balacha distincta (Signoret)

Lectotype: 1 ♂, "Columbia \ Coll. Signoret", "distincta \ det. Signoret", NHMW.

Additional specimens: 4 ♂ e 1 ♀, "Brazil: \ M. Alvarenga \ B.M. 1971-165", BMNH; 1 ♀, "Brazil: S. Paulo \ S[ão]. Jose [do] Barreiro [approx. 22°38'S 44°34'W, c. 511m] \ Serra

Bocaina", "1960 m. XI.1970 \ M. Alvarenga \ 1971-165", BMNH; 1 ♂, "S[ão]. José do Barreiro \ Serra da Bocaina \ Faz[enda]. do Bonito, SP \ M. A. Vulcano col.", DZUP; 1 ♂, without locality data, "19.605", MZSP.

New record: São Paulo State (Brazil).

Balacha lepida Cavichioli & Sakakibara

Holotype: 1 ♂, "Castro [approx. 24°47'S 50°00'W, c. 999m] – PR \ Brasil IX-61 \ S. Laroca leg", DZUP.

Paratypes: 2 ♂, "S[ão]. J[osé dos]. Pinhais [approx. 25°32'S 49°12'W, c. 906m] – PR \ Brasil II-82 \ Cavichioli leg", DZUP.

Balacha melanocephala (Signoret)

Neotype: 1 ♂, "Curitiba [approx. 25°25'S 49°16'W, c. 934m] PR \ Brasil III-1983 \ Sakakibara leg", DZUP. **Neotype herein designated.**

Additional specimens: 1 ♀, "Tettigonia \ melanocepha \ la Signt, \ Montevideo [Uruguay, approx. 34°53'S 56°11'W]", "melanoceph. \ det. Signoret", NHMW; 1 ♂, "Rep[resa da]. Vossoroca \ PR – 23-XI-1985 \ A. M. Sakakibara \ leg", DZUP; 1 ♂, "Curitiba PR \ Brasil III-1980 \ Cavichioli leg", DZUP; 1 ♀, "Curitiba – PR \ Br 5-III-1981 \ R. R. Cavichioli", DZUP; 1 ♀, "Castro [approx. 24°47'S 50°00'W, c. 999m] – PR \ Brasil XII – 51 \ S. Laroca leg", "Dpt° Zool \ UF – Paraná", DZUP; 1 ♀, "Argentina \ B[ueno]s. Aires [approx. 34°36'S 58°27'W] \ 12/55", "Pres. A. Harman \ B.M. 1972-311", BMNH; 1 ♀, "Argentina: \ Punto [sic, Punta] Lara [approx. 34°49'S 57°59'W] \ 17-viii-1938", "R. Maldonado \ B.M. 1971-313.", BMNH; 1 ♂ e 2 ♀, "Argentina: \ Delta [of Parana River, approx. 34°12'S 58°18'W] – ii – 1953 \ s/ planta", "silvestres \ Coll. Turica \ B.M. 1971-313.", BMNH; 2 ♀, "Argentina. \ Isla Los Cisnes. \ Parana Delta \ v-xi 1920. \ HE. Box", BMNH; 2 ♂ e 2 ♀, "Ibicuycito B[ueno]s A[ire]s \ 28-II-938 \ S.R. Castillo col.", BMNH; 1 ♂ e 1♀, "Santa Cruz [do Sul ?, approx 29°43'S 52°25'W] \ Rio Grande do Sul \ Fr. Stieglmayr leg. \ vend. 10. VII. 1895", "Collectio \ Dr. L. Melichar \ Moravské museum Brno", MMBC.

New records: Uruguay and Argentina.

Balacha rubripennis Cavichioli & Sakakibara

Holotype: 1 ♂, "S[ão]. J[osé dos]. Pinhais [approx. 25°32'S 49°12'W, c. 906m] PR \ Brasil 25/XI/1985 \ Cavichioli leg", DZUP.

Paratypes: 1 ♂ e 1 ♀, "S. J. Pinhais PR \ Brasil 25/XI/1985 \ Cavichioli leg", DZUP; 1 ♀, "Araucaria [approx. 25°35'S 49°24'W, c. 897m] – PR \ Brasil VI-61 \ S. Laroca leg", DZUP; 1 ♂, "Curitiba [approx. 25°25'S 49°16'W, c. 934m] – PR \ Brasil 16-11-66 \ C. Ext. D.Z.U.F.P.", DZUP; 1 ♀, "Curitiba – PR \ 13-III-1981 \ R. R. Cavichioli", DZUP; 1 ♀, "Curitiba PR \ Brasil I-1981 \ R. R. Cavichioli", DZUP; 1 ♀, "Rep[resa da]. Vossoroca \ PR – 23-XI-1985 \ A. M. Sakakibara", DZUP.

Balacha similis Cavichioli & Sakakibara

Holotype: 1 ♂, "Curitiba [approx. 25°25'S 49°16'W, c. 934m] PR \ BR – X-1984 \ A. M. Sakakibara \ leg", DZUP.

Paratypes: 1 ♀, same data as holotype, DZUP; 1 ♂, "Curitiba – PR \ BR 13-III-1981 \ R. R. Cavichioli", DZUP; 5 ♂ e 1 ♀, "Rep[resa da]. Vossoroca \ PR . 23-XI-1985 \ A. M. Sakakibara leg", DZUP; 1 ♀, "Porto Alegre [approx. 30°01'S 51°13'W, c. 3m] – RS \ Brasil II-1982 \ A. M. Sakakibara", DZUP.

Additional specimens: 1 ♂ e 1 ♀, "Brasil, RJ \ Petrópolis [approx. 22°30'S 43°10'W, c. 2,200m] \ 12-VI-1992 \ G. Mejdalani", BMNH; 9 ♂ e 5 ♀, "Açú - Petrópolis - RJ \ 12/VI/1992 \ J. L. Nessimian col. \ (2.200 m)", DZRJ; 1 ♀, "Brasil- Minas Gerais \ Poços de Caldas [approx. 21°47'S 46°33'W c. 1,200m] \ Retiro dos Carneiros \ 23.VII.1969 J. Becker \ O. Roppa e O. Leoncini cols.", MNRJ; 3 ♂ e 6 ♀, "Brasil - Minas \ Gerais – Itamonte [approx. 22°17'S 44°52'W, c. 2,100m] \ 10-14/IX/1998 \ Takiya / Lab. Ent[omology Lab staff, UFRJ].", DZRJ; 2 ♂ e 6 ♀, same data as preceding except "13–15/XI/1998 \ D. Takiya leg.", DZRJ; 5 ♂ e 5 ♀, "Itamonte – M.G. \ Brasil \ 30/IX-03/X/1999 \ Takiya / Lab. Ent.", DZRJ; 1 ♀, "P[arque]. N[acional de]. Itatiaia RJ \ 8/X/1990 \ J. L. Nessimian", DZRJ; 1 ♂ e 1 ♀, "Fazenda Cerro Negro \ São Francisco de \ Assis [approx. 29°33'S 55°07'W, c. 151m] – R. S. – Brasil \ 22-31/XII/1998 \ D. M. Takiya leg.", DZRJ.

New records: Minas Gerais and Rio de Janeiro states (Brazil).

Outgroups:

Amblyscarta bicincta (Germar)

1 ♂ and 1 ♀, "Belize: Toledo \ 25m n.w. of Punta \ Gorda, Salamanca \ 28.viii. – 4.ix.1978.", "P. S. Broomfield \ B.M. 1979-33", additionally ♂, "Clearing in \ primary forest", ♀, "Primary/ \ Secondary forest", DZUP.

Amblyscarta invenusta Young

1 ♂ and 1 ♀, "Campinas – Goiaz \ Borgmeier et \ S. Lopes XII-935", MNRJ; 1 ♂, "Formosa (Goias- \ VII-1960-86/60 \ Exp. Formosa col.", MNRJ; 1 ♀, "Picinguaba \ SP \ 5-6/III/1999 \ D. M. Takiya", DZRJ.

Amblyscarta stillifera (Stål)

1 ♂, "Rest[inga de]. Marica – RJ \ 25/XI/1989 \ G. Mejdalani", DZRJ; 1 ♂, same data as preceding, except "5/IV/1990", DZRJ; 1 ♀, same data as preceding, except "16-V-1987 \ J. L. Nessimian", DZRJ.

Caragonalia carminata (Signoret)

1 ♂, "Schubart, S. A. \ Local: Araras – RJ \ Hora: 13:30 \ Dia: 13/6/96", MNRJ; 1 ♂, same data as preceding, except "Hora: 10:10 \ Dia: 1/6/96, MNRJ; 1 ♀, "S[erra da]. Bocaina. 1300m \ Parq[ue de]. Criaç[ão de]. Trutas \ S.P. março – 1954 \ Dalcy. R. Barros", MNRJ; 1 ♀, "Boracea 20.3.68 \ S. Paulo, Brasil \ H. S. Lopes", MNRJ.

Caragonalia tarsalis (Signoret)

1 ♂ and 1 ♀, "Cachoeiras de \ Macacu – RJ \ 25-IV-1992 \ E. R. da Silva", DZRJ; 1 ♂ and 1 ♀, "Barueri – SP \ VIII. 1957 \ Lenko leg.", DZRJ; 1 ♂, "Cascatinha \ N[ova]. Friburgo \ 3-II-1993 \ M. E. Felix col. \ (em luz)", DZRJ.

Pawiloma ancora Young

1 ♂ and 1 ♀, "Ilha Grande \ Mangaratiba – RJ \ 20-28/II/1984 \ Sampaio / Kosawa \ Carvalho", DZRJ.

Pawiloma victima (Germar)

1 ♂, "Faz[enda]. Cerro Negro \ São Francisco de \ Assis – R.S. Brasil \ 22-23/XII/1998 \ D. M. Takiya leg", DZRJ; 1 ♀, "Fazenda Cerro Negro \ São Francisco de Assis \ RS – Brasil \ 26-28-XII-1999 \ Takiya & Buss leg.", DZRJ; 1 ♂ and 1 ♀, "Guarapuava \ PR – Brasil \ X-1967 \ Schneider col.", MNRJ; 1 ♂ and 1 ♀, "Faz[enda]. Boa Vista \ Delfim Moreira M.G. \ 03/VI/1999 \ J. L. Nessimian", DZRJ; 1 ♂, "Curitiba PR \ Brasil 23-X-1981 \ A.M.S. e R.R.C.", DZUP.

Pegogonia rufipes (Fabricius)

1 ♀, "Santa Bárbara – MG \ Brasil 1-5/II/1985 \ Col. Mielke e Casagrande", DZUP.

Sibovia picchitula Young

1 ♂ and 1 ♀, "Torentoy Canyon \ (base Macchu Picchu) \ 2000-2200 m, Peru \ VI-VII. 1964, Malkin", DZRJ.

Sibovia sagata (Signoret)

1 ♂, "Picinguaba – SP \ 25-VI-97 \ Takiya col., DZRJ; 1 ♂, "Teresópolis – RJ \ 20-VI-97 \ Takiya col.", DZRJ; 1 ♂, "P[arque]. N[acional de]. Itatiaia, RJ \ Abrigo nº 1 \ 01/VIII/86 \ Boa Nova", DZRJ; 2 ♀, "Fazenda Cerro Negro \ São Francisco de Assis \ RS – Brasil \ 19-XII-1999 \ Takiya & Buss leg.", DZRJ; 1 ♀, "Madalena – RJ \ I-1974 \ J.A.P. Dutra", DZRJ; 1 ♀, "Teresópolis – RJ \ 14-IX-97 \ D. M. Takiya col., DZRJ.

Caragonia, a new genus of Cicadellini (Hemiptera: Cicadellidae: Cicadellinae) from Southeastern Brazil.

Daniela M. Takiya [1, 2, 3], Rodney R. Cavichioli [4] & Gabriel Mejdalani [5]

[1] Laboratório de Entomologia, Departamento de Zoologia, Universidade Federal do Rio de Janeiro (UFRJ), Caixa Postal 68044, 21944-970 Rio de Janeiro, RJ, Brasil; [2] E-mail: takiya@acd.ufrj.br; [3] Pós-graduação em Zoologia, Museu Nacional, UFRJ; [4] Departamento de Zoologia, Universidade Federal do Paraná, Caixa Postal 19020, 81531-990 Curitiba, PR, Brasil; [5] Departamento de Entomologia, Museu Nacional, UFRJ, Quinta da Boa Vista, São Cristóvão, 20940-040 Rio de Janeiro, RJ, Brasil.

ABSTRACT

Caragonia n. gen. is described and placed in the nominate tribe of the subfamily Cicadellinae, based on a previous phylogenetic analysis of the closely related genus *Balacha* Melichar. The new genus can be distinguished from other Neotropical genera of Cicadellini by a combination of plesiomorphic and apomorphic features as follows: crown little produced with anterior margin broadly round; transition crown-face forming an approximately 90 degrees angle; posteriorly elevated pronotum; forewing clavus with jugal margin bordered with dark brown; elongate female sternite VII with a median longitudinal elevated fold; bases of first valvulae of ovipositor presenting a distinct concavity; and teeth of second valvulae of ovipositor gradually declivous posteriorly. *Caragonia bella* n. sp. is described and illustrated from Southeastern Brazil (São Paulo and Minas Gerais states). *Caragonalia monstruosa* (Signoret) is transferred to the new genus proposed based on putative female synapomorphic characters shared with *Caragonia bella* n. sp.

Keywords: Cicadellidae, Cicadellinae, Taxonomy, *Caragonalia monstruosa* (Signoret), New Genus, New Species.

INTRODUCTION

In a cladistic analysis of the species of the genus *Balacha* Melichar (Cicadellinae: Cicadellini) based on morphological characters, TAKIYA & MEJDALANI (in prep.[2]) included 11 species as outgroup taxa mostly belonging to the *Erythrogonia* Melichar generic group proposed by YOUNG (1977: 770). One of the outgroup taxa included was a new Cicadellini species, which was represented by specimens collected during field trips to the county of Itamonte (Minas Gerais State, Brazil) by two of the authors (DMT and GM) and others deposited at the Departamento de Zoologia, Universidade Federal do Paraná (DZUP). The new species keys to *Balacha* Melichar (couplet 18) in YOUNG'S (1977) key to New World Cicadellini. This species was believed to be clearly closely related to the genera *Balacha* Melichar and *Pegogonia* Young considering the male genitalia structures, but also very similar to *Caragonalia monstruosa* (Signoret) considering the external appearance and shape of the female sternite VII (males are unknown in the latter species). In the cladistic analysis of the genus *Balacha*, which also included besides all known *Balacha* species the monotypic *Pegogonia* and the other two described species of *Caragonalia* Young, the new species was found to be the sister group of *Pegogonia* + *Balacha* (TAKIYA & MEJDALANI in prep.). This clade is well supported and present in all most parsimonious trees found in the analysis. Taking into account the phylogenetic position of the new species, it is placed in a new genus and is described in the present work. Based on female genitalia features,

[2] Takiya, D. M. & Mejdalani, G. (in prep.) Systematics of the genus *Balacha* Melichar (Hemiptera: Cicadellidae: Cicadellini).

Tettigonia monstruosa Signoret, treated by YOUNG (1977) as a *Caragonalia* species, is transferred herein to the new genus proposed.

MATERIALS AND METHODS

The studied specimens are deposited in the collections of the Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ, Rio de Janeiro, Brazil), Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro (DZRJ, Rio de Janeiro, Brazil), and Departamento de Zoologia, Setor de Ciências Biológicas, Universidade Federal do Paraná (DZUP, Curitiba, Brazil). In quotations of label data, a reversed virgule (\) separates lines on a label. Most morphological terminology follows YOUNG (1968, 1977), but terminology for the head structures follows HAMILTON (1981), as suggested by MEJDALANI (1998), and that of the female genitalia follows NIELSON (1965). Techniques for preparation of genital structures follow those of OMAN (1949). The dissected parts are stored in microvials with glycerin.

Caragonia, new genus

(Figs. 1-14)

Type-species. *Caragonia bella*, new species, by present designation.

External morphology. Crown (Fig. 1) slightly produced; surface finely granular on anterior half and smooth posteriorly; anterior margin broadly rounded; without carina at transition from crown to face; median length of crown approximately four-tenths interocular width and three-tenths transocular width. Ocelli (Fig. 1) located slightly behind imaginary transversal line between anterior eye angles; each ocellus separated from the other by three times the distance between ocellus and adjacent compound eye. Antennal ledges (Fig. 1) slightly protuberant in dorsal view; dorsal margin not carinate, rectilinear

and oblique, descending anteriorly in lateral view. Frons flattened; disc surface finely granular; muscle impressions distinct. Epistomal suture incomplete along small median distance. Clypeus strongly produced; contour of its inferior portion forming angle with remainder of face; disc setose.

Pronotum (Fig. 1) width slightly greater than transocular width of crown; disc finely transversely striated; lateral margins slightly convergent anteriorly; posterior margin very slightly concave. Mesonotum (Fig. 1) smooth, finely transversely striated behind transverse sulcus. Forewings (Fig. 1) coriaceous and smooth; without distinct membrane; without anteapical plexus of veins; presenting three closed anteapical cells and five apical cells; base of third apical cell more distal than all other apical cell bases. Hindlegs with femoral apex setal formula 2:1:1; basal tarsomere approximately as long as combined length of two more distal tarsomeres; plantar surface with two parallel rows of undifferentiated setae.

Coloration. Head and thorax mostly black (Fig. 1). Forewings (Fig. 1) red with black maculae on corium and clavus and large black apical area.

Male genitalia. Male unknown in *Caragonia monstruosa* (Signoret) n. comb. Genitalia structures as in *C. bella* n. sp.

Female genitalia. Abdominal sternite VII (Fig. 10) with disc presenting median longitudinal fold almost throughout its length; posterior margin with narrow concavity; lateral margins very produced posteriorly. First valvifers (Fig. 8) with posterodorsal margin broadly convex in lateral view. First valvulae of ovipositor (Fig. 11) in ventral view with bases presenting a median concavity on anterior margin. Internal abdominal sternite VIII (Fig. 9) in dorsal view sclerotized, forming single transversal plate; posterior margin broadly concave. Pygofer (Fig. 9) in lateral view not very produced posteriorly; posterior margin narrowly round; macrosetae distributed on posterior half. Second valvulae of

ovipositor (Fig. 14) in lateral view broadened beyond 1/3 of total length excluding basal curvature; slightly tapering to apex; shaft bearing continuous teeth throughout broadened portion; teeth elongate (Fig. 12), regularly declivous posteriorly, denticles present along dorsal margin; preapical area of shaft (Fig. 13) with dorsal and ventral margins bearing denticles, with proeminence slightly distinct; apex of shaft narrowly rounded.

Taxonomic notes. The new genus *Caragonia* shares some plesiomorphic traits with the genera *Caragonalia* and *Pegogonia* that distinguish it from the genus *Balacha*, like the little produced crown with anterior margin broadly round (Fig. 1), transition crown-face forming an approximately 90 degrees angle, posteriorly elevated pronotum, and teeth of second valvulae of ovipositor gradually declivous posteriorly (Fig. 12). The cladistic analysis of the genus *Balacha* (TAKIYA & MEJDALANI in prep.) suggests some putative synapomorphies for the new genus *Caragonia* based on autapomorphies of *C. bella* n. sp., as follows: (1) forewing clavus with jugal margin bordered with dark brown (Fig. 1), (2) elongate female sternite VII with a median longitudinal elevated fold (Fig. 10), and (3) bases of first valvulae of ovipositor presenting a distinct concavity (Fig. 11). These female genitalia synapomorphies occur independently in the red *Balacha* clade (TAKIYA & MEJDALANI in prep.). The character 3 and other putative synapomorphies based on male genitalia (pygofer with robust ventral processes, elongate styles with acute apices and elongate aedeagus shaft) are still unknown in *Caragonia monstruosa* n. comb.

Species of *Caragonia* new genus

C. bella. São Paulo and Minas Gerais states, Brazil. New species.

C. monstruosa (Signoret), 1853: 335 (*Tettigonia*). São Paulo State, Brazil. New combination.

Caragonia bella, new species

(Figs. 1-14)

Length: female, 10.4-11.2mm; male, 10.8-11.4 mm.

External features and female genitalia as described for the genus.

Coloration. Head black (Fig. 1); subtriangular maculae on crown between ocelli and markings over frontogenal sutures, tan. Thorax (Fig. 1) black. Forewings (Fig. 1) red; small preapical macula on costal margin, macula near base and another near apex of discal cells, small macula over base of claval suture and larger one along jugal margin of clavus, which can be continuous on its median portion to small macula over median portion of claval suture (absent in some specimens), and large apical area including first through fourth apical cells and apices of fifth apical, anteapical and brachial cells, black. Legs black; setae and joints tan. Abdominal sternites black.

Male genitalia. Pygofer (Fig. 2) in lateral aspect moderately produced; posterior margin broadly convex; macrosetae and few microsetae on posterior half only; ventral margin of inner portion in caudal aspect with pair of robust digitate processes extending dorsally (Fig. 5). Valve (Fig. 7) transverse; anterior and posterior margins broadly concave. Subgenital plates (Fig. 7) robust, ellipsoid; linked basally by membranous area; not extending posteriorly as far as pygofer apex (Fig. 2); each with few dispersed macrosetae on disc and few microsetae on apex; very small dentiform tegumentary processes throughout plate; apex round. Connective (Fig. 4) in dorsal aspect Y-shaped; arms approximately as long as stalk; with dorsal median keel. Styles (Fig. 4) in dorsal aspect slender and very elongate; extending posteriorly much farther than apex of connective; without conspicuous lobe; presenting microsetae on apical third; apex acute. Aedeagus (Fig. 3) symmetrical; curved on its base by almost 180 degrees; shaft cylindrical, slender and elongate; presenting two dorsal rows of small dentiform tegumentary processes on

apical fourth extending laterally on preapical portion; apex directed posteriorly; pair of continuously sclerotized apical processes. Paraphyses (Fig. 4) present; elongate; bifurcate; stem much longer than rami; short divergent rami directed laterally.

Type material. Holotype: male, "Brasil - Minas / Gerais - Itamonte / 16-20/X/1997 / Felix, Mejdalani, Takiya", MNRJ. Paratypes: 3 males, same label data as holotype, MNRJ; 1 male, same label data as holotype, except "10-14/IX/1998 / Takiya/Lab. Ent.", MNRJ; 3 males, same label data as holotype, DZRJ; 2 females, "C. Jordão – SP \ Br.XI.1957 \ K. Lenko – col", DZUP; 1 female, "Campos do Jordão \ São Paulo \ XII.1957 \ Lenko leg.", DZUP.

Taxonomic notes. Based on SIGNORET'S (1853: Plate 9, Fig. 2) habitus illustration of *Caragonia monstruosa* and YOUNG's (1977: Fig. 200i) illustration of the female sternite VII of the lectotype of this species, *C. bella* can be easily distinguished from *C. monstruosa* by the presence of an extra black macula on the forewing corium (Fig. 1) and by the female sternite VII with more slender lateral margins and more inwardly produced median concavity on posterior margins (Fig. 10).

Habitat notes. All specimens collected at Itamonte (Minas Gerais State) were probably found at the damp habitat described by TAKIYA **et al.** (in press), a paper in which *Caragonia bella* is cited as *Caragonalia* **cf.** *monstruosa*. Four-day collecting trips to the same locality were conducted in four consecutive years (1997-2000) around mid-September and October. Interestingly, males of *C. bella* were found abundant only in 1997 which was the only trip conducted on mid-October. The other trips were conducted around early September to early October and then *C. bella* was collected rarely (1998) or not at all (1999 and 2000). The specimen collected in 1998 was found on *Senecio icoglossus* DC. (Asteraceae).

ACKNOWLEDGEMENTS

R. L. Esteves (Museu Nacional, UFRJ, Rio de Janeiro) kindly determined the Asteraceae species. The manuscript benefited from the useful comments of A. L. Carvalho (Museu Nacional, UFRJ, Rio de Janeiro), C. H. Dietrich (Illinois Natural History Survey, Champaign), M. Felix (Museu Nacional, UFRJ, Rio de Janeiro), C. Moreira (Universidade de São Paulo, São Paulo), and A. dos Santos (Universidade de São Paulo, São Paulo). A fellowship from Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES, Brazil) to DMT during her M.Sc. studies is greatly acknowledged. This study was supported in part by Universidade Federal do Rio de Janeiro and Fundação Universitária José Bonifácio (FUJB, Brazil).

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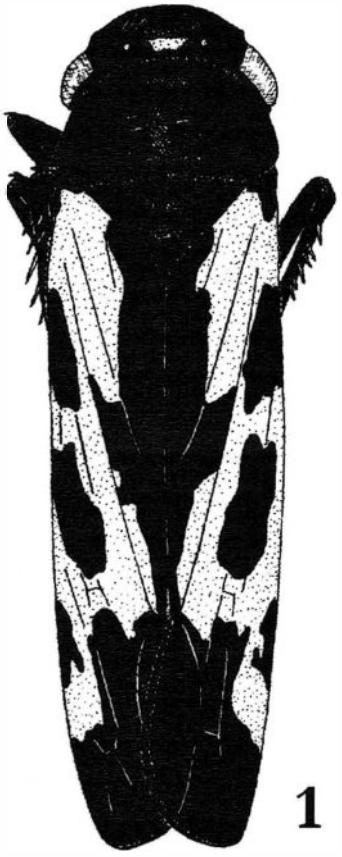
Figs. 1-7, *Caragonia bella,* n. gen. n. sp. **Fig. 1,** dorsal habitus of male holotype. **Figs. 2-7,** male genitalia. **Fig. 2,** pygofer, anal tube, valve, subgenital plate, style, and aedeagus, lateral view. **Fig. 3,** aedeagus, lateral view. **Fig. 4,** connective, style, and paraphyses, dorsal view. **Fig. 5,** pygofer apex, caudal view. **Fig. 6,** detail of aedeagus apex, ventral view. **Fig. 7,** valve and subgenital plate, ventral view.



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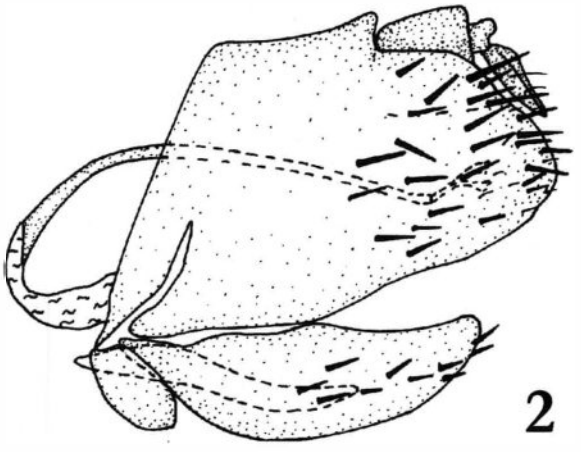

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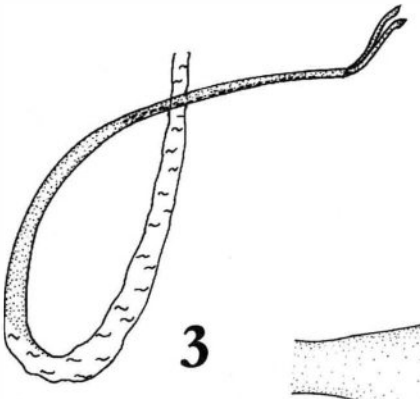

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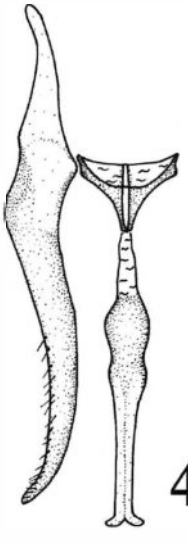

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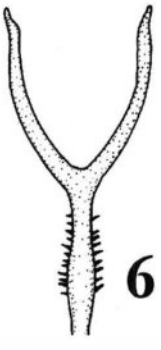

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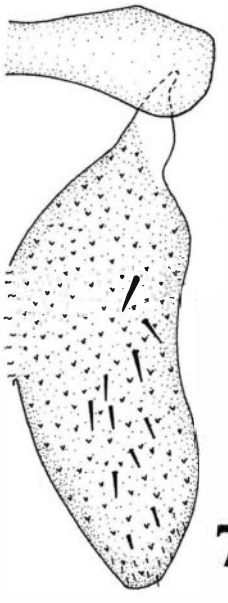

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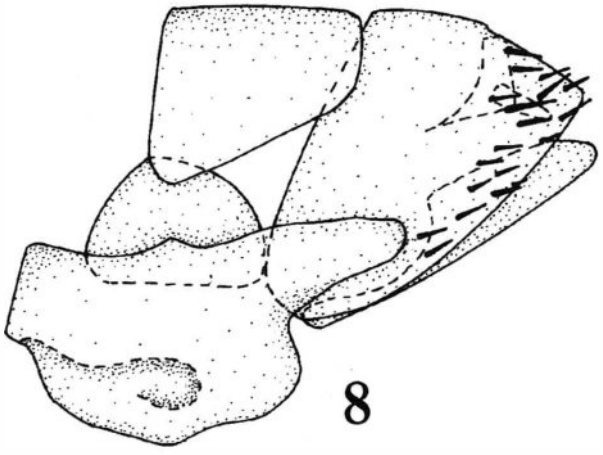
Figs. 8-14, *Caragonia bella*, n. gen. n. sp., female genitalia. **Fig. 8,** sternite VII, first valvifer, tergite VIII, pygofer, gonoplac, and anal tube, lateral view. **Fig. 9,** sternite VII, tergite VIII, and internal sternite VIII, dorsal view. **Fig. 10,** sternite VII, pygofer, ovipositor valvulae (bases not depicted), and gonoplacs, ventral view. **Fig. 11,** base of first valvula and first valvifer, ventral view. **Figs. 12-14,** second valvula of ovipositor, lateral view. **Fig. 12,** tooth XI from base. **Fig. 13,** detail of apex. **Fig. 14,** general aspect.



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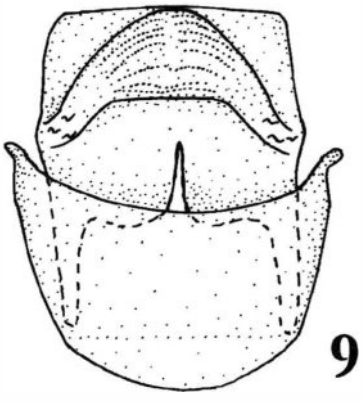

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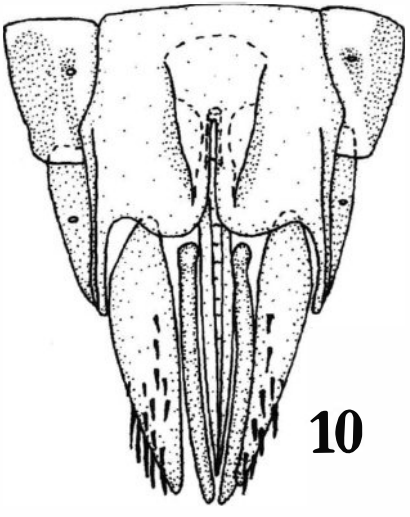

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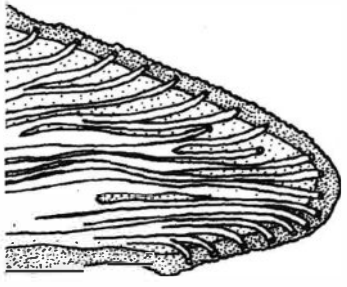

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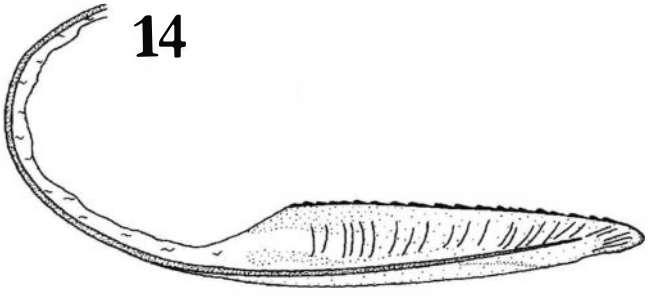

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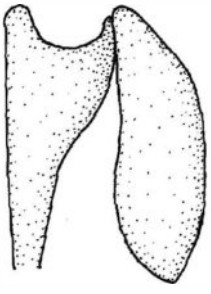

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CONCLUSÕES GERAIS

1) Seis espécies são consideradas válidas no presente estudo de revisão taxonômica do gênero *Balacha* Melichar: *B. decorata* Cavichioli & Sakakibara, *B. distincta* (Signoret), *B. lepida* Cavichioli & Sakakibara, a espécie-tipo *B. melanocephala* (Signoret), *B. rubripennis* Cavichioli & Sakakibara e *B. similis* Cavichioli & Sakakibara.

2) O espécime-tipo de *B. melanocephala* é considerado perdido, de maneira que um neótipo é designado para a espécie e depositado na coleção do Departamento de Zoologia, Universidade Federal do Paraná, Curitiba.

3) O gênero *Balacha* aparentemente está restrito ao sudeste e sul da América do Sul, sendo registros prévios na literatura para a Colômbia considerados errôneos.

4) Uma análise cladística, com base em 64 caracteres morfológicos, das espécies do gênero *Balacha*, incluindo também onze representantes de alguns gêneros considerados relacionados, utilizados como grupos-externos, resultou em duas hipóteses mais parcimoniosas de relacionamento entre esses táxons inteiramente dicotômicas, com 141 passos, índice de consistência = 0,634 (0,570 excluindo as autapomorfias), índice de retenção = 0,738 e índice de retenção rescalonado = 0,471. A árvore de consenso estrito apresentou a seguinte topologia: *Amblyscarta stillifera* ((*A. bicincta* + *A. invenusta*) ((*Sibovia picchitula* + *S. sagata*) ((*Pawiloma ancora* + *P. victima*) (*Caragonalia carminata* + *C. tarsalis*) (Cicadellini n. gen. n. sp. (*Pegogonia rufipes* ((*B. decorata* (*B. melanocephala* + *B. similis*)) (*B. lepida* (*B. distincta* + *B. rubripennis*)))))))).

5) A hipótese de monofiletismo de *Balacha* é corroborada, sendo sustentada por uma série de sinapomorfias no plano básico do gênero, como coroa anteriormente pronunciada, com a margem anterior subangular, transição coroa-fronte, em vista dorsal, formando um ângulo agudo, pronoto, em vista lateral, continuando o perfil dorsal da cabeça e mesonoto,

corpo do edeago sem processos cuticulares e dentes da segunda válvula do ovipositor apresentando uma projeção dorsal na metade anterior.

6) O Cicadellini não identificado incluído na análise cladística de *Balacha* é tratado como um novo gênero, *Caragonia* n. gen., devido ao seu posicionamento filogenético na análise. *Caragonia bella* n. sp. é descrita e ilustrada com base em espécimes de São Paulo e Minas Gerais, sudeste do Brasil. *Caragonalia monstruosa* (Signoret) é transferida para o gênero proposto devido a uma combinação de características plesiomórficas e prováveis sinapomorfias compartilhadas por ambas espécies, como a coroa pouco pronunciada, com margem anterior largamente arredondada, transição coroa-fronte formando aproximadamente um ângulo da 90 graus, pronoto elevado posteriormente, clavo das asas anteriores com a margem jugal marrom escura, esternito abdominal VII feminino alongado com uma dobra mediana longitudinal, bases da primeira válvula do ovipositor apresentando uma concavidade distinta e dentes da segunda válvula do ovipositor gradualmente em declive posteriormente.

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